PROCEEDINGS *of the* HAWAIIAN ENTOMOLOGICAL SOCIETY *for* 1951

VOL. XIV, No. 3
MARCH, 1952

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Harry S. Smith
O. H. Swezey
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F. X. Williams

MEMBERSHIP 1951

Adachi, Marian
Alicata, J. E.
Au, Helen
Au, Stephen
Balock, J. W.
Beardsley, J. W.
Bess, Henry A.
Bianchi, F. A.
Blalock, J. R.
Bonnet, D. D.
Bryan, E. H., Jr.
Callan, E. McC.
Carter, Walter
Chilson, L. M.
Chong, Mabel
Christenson, L. D.
Clagg, C. F.
Clancy, D. W.
Davis, C. J.
Defibaugh, Betty Lou
Doutt, R. L.
Dresner, Edgar
Faxon, Richard
Finney, G. L.
Flitters, N. E.
Ford, E. J., Jr.
French, E. W.
Hagen, K. S.
Haramoto, F. H.
Hardy, D. Elmo
Himeno, Edward
Hinman, F. G.
Holdaway, F. G.
Hu, Stephen M. K.
Inada, Constance
Ito, K.
Jensen, D. D.
Joyce, C. R.
Kamasaki, Hitoshi
Keck, C. B.
Krauss, N. L. H.
Kumabe, Bunki
Lepesme, Pierre
Look, Wm. C.
McBride, O. C.
Maehler, K. L.
Marlowe, R. H.
Marucci, P. E.
Matsuura, M.
Messenger, P. S.
Mitchell, W. C.
Mumford, E. P.
Nakagawa, Susumu
Newell, I. M.
Nihei, C. T.
Nishida, Takiyuki
Nowell, W. R.
Owen, R. P.
Pemberton, C. E.
Rathburn, Francis
Ritchie, C. L.
Roan, C. C.
Rosa, J. S.
Sakimura, K.
Schmidt, C. T.
Sherman, John D.
Sherman, Martin
Steiner, L. F.
Stone, W. E.
Stout, O. O.
Suehiro, Amy
Tamashiro, Minuro
Tanada, Yoshinori
Thomsen, Walter
Tuthill, L. D.
Usinger, R. L.
van den Bosch, Robert
Van Zwaluwenburg, R. H.
Weber, P. W.
Wellhouse, W. H.
Wirth, W. W.
Yasuda, Charles
Zimmerman, E. C.

OFFICERS FOR 1931

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MEMBERSHIP 1931

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Bonnet, D. D.
Bryan, E. H., Jr.
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PROCEEDINGS

OF THE

Hawaiian Entomological Society

VOL. XIV, No. 3 FOR THE YEAR 1951 MARCH, 1952

JANUARY 8, 1951

The 541st meeting was held at the H.S.P.A. Experiment Station on Monday, January 8, at 2:00 p.m., with President Hardy in the chair.

Members present: Bess, Bianchi, Bryan, Chong, Clancy, Defibaugh, Dresner, Finney, Fullaway, Hagen, Haramoto, Hardy, Hinman, Ito, Marucci, Messenger, Mitchell, Newell, Nishida, Pemberton, Peterson, Rathburn, Rosa, Martin Sherman, Steiner, Swezey, Thomsen, van den Bosch and Van Zwaluwenburg.

PAPER

Dr. Swezey presented his paper: "Insect Fauna of a Coconut Tree," and in discussing it exhibited many of the species concerned.

NOTES AND EXHIBITIONS

A NEW HOST OF AMORBIA—Mr. Peterson reported that on December 10, Mr. Thomsen and he found larvae of the tortricid moth, *Amorbia emigratella* Busck feeding within folded leaves of *Cassia leschenaultiana* (*C. mimosoides*) at Waiahole, Oahu. This appears to be a hitherto unrecorded hostplant for this insect.

ARGENTINE ANT—Mr. Steiner reported that because of the possible importance of this ant as a predator on *Dacus dorsalis* Hendel, collections of ants were made at 14 scattered locations in or near Opaeula and Helemano gulches, Oahu, on November 30. Weekly guava collections had been made since the previous June to observe oriental fruit fly populations. The Argentine ant was the sole species found at seven of the stations, with *Pheidole* present at the others. Near one location *Iridomyrmex* ants were nesting inside a wind-recording instrument in such numbers as to interfere with its performance. The locations at which Argentine ant was found included three along the military road (Route 135) crossing Opaeula gulch, one in a gulch one-quarter of a mile north, one on the road where it turns into the mountains, and two in the upper end of a lateral gulch of Opaeula, nearly one mile west of the gulch infestation. Subsequently the Argentine ant was found in the woods on the north rim of Opaeula gulch where Riggs Battery was located during the recent war. These findings indicate that *Iridomyrmex* is present over at least 8 square

miles of area bordering the Koolau mountains on the west, near the junction of sugar cane and pineapple fields.

Mr. Ito said that after receiving the above information from Mr. Steiner, he made a survey above Opaeula to determine the present distribution of the Argentine ant. Assuming, as the evidence suggests, that Riggs Battery was the original site of the infestation, the ant has now spread one mile up Opaeula gulch, and seaward, down to the government road. Opaeula gulch is infested on both sides; the ant has crossed narrow pineapple fields into secondary gulches on both sides of the main Opaeula gulch, and at present dominates the upper parts of these valleys. In the direction of Wahiawa, along the military road, infestation has reached Hawaiian Pineapple Co.'s fields 4705 and 4711. Invasion of Anahulu gulch, in the direction of Waialua, has probably been under way for some time, as the ant was found from the native forest almost halfway down the border of Field 4717, and strong colonies were present where the Army road crosses the streambed of Anahulu gulch.

Consensus of the discussion that followed was that the Argentine ant is both a feeder on sweets and predaceous. Mr. Rosa reported seeing it attack both adults and eggs of *Coelophora* beetles in the field.

FEBRUARY 12, 1951

The 542nd meeting was held at the H.S.P.A. Experiment Station on Monday, February 12, at 2:00 p.m., with President Hardy in the chair.

Members present: Adachi, Bess, Bryan, Carter, Clagg, Defibaugh, Dresner, Finney, Fullaway, Hagen, Haramoto, Hardy, Keck, Marucci, Messenger, Mitchell, Newell, Nishida, Pemberton, Peterson, Ritchie, Rosa, Schmidt, Martin Sherman, Suehiro, Swezey, Thomsen, van den Bosch, Van Zwaluwenburg and Wellhouse.

Visitors: J. W. Beardsley and Dr. Walter Ebeling.

NOTES AND EXHIBITIONS

ENCARSIA FORMOSA Gahan—Dr. Swezey exhibited a leaf of *Sonchus oleraceus* heavily infested with *Trialeurodes vaporariorum* (Westwood). Some of the aleurodids were parasitized, as shown by their black color. A slide mount was exhibited of the parasite, the aphelinid, *Encarsia formosa,* introduced into Hawaii in 1942, and liberated at Waianae. The leaf exhibited was collected February 10 at Makaha, Oahu, in a weed patch within a mile of where the parasite had been liberated. This shows that the parasite is keeping up its existence in the Waianae district. Dr. Sherman added that he had recently seen *Encarsia* in aleurodid colonies in greenhouses.

IRIDOMYRMEX HUMILIS Mayr—Mr. Thomsen reported finding the Argentine ant established at Schofield Barracks Ordnance Depot on January 21. The infestation extends for one-half mile along one side of a road adjacent to the depot; it was observed that where the Argentine ant did

not occur, *Pheidole megacephala* (F.) was abundant, while where *Iridomyrmex* was present, no other ants were found. This infestation again associates the Argentine ant with a military installation. Most of the known locations of the ant in these Islands are in association with camps, and the species is believed to have been spread by movement of military stores or equipment.

Mr. Van Zwaluwenburg said that a survey made January 10-12 by Mr. Rosa and himself showed the Argentine ant to be widely spread at Waialua Plantation Co., in fields in the Helemano and Opaeula sections on either side of Opaeula gulch. The ant extends toward the sea as far as Pump 3, but none were found below the main highway.

HOST RECORDS OF DACUS DORSALIS Hendel—Dr. Carter reported the following previously unrecorded host fruits of the oriental fruit fly, the result of work by Messrs. Maehler and Davis on Maui:

Sandoricum koetjape ("santol"). From 202 fruit weighing 23,163 grams, collected at Kahakuloa during November, 1950, 1,572 puparia were recovered, from which emerged 474 *D. dorsalis* and 428 *Opius persulcatus* (so-called) [1].

Garcinia celebica. From 26 fruits, weighing 1,330 grams, collected at Kahakuloa during November, 71 puparia were recovered, from which emerged 64 *D. dorsalis* and 1 *O. persulcatus* (so-called).

Physalis peruviana ("poha"). From 34 fruits weighing 99 grams, collected at Makaoioi, June 14, 3 puparia were recovered from which 1 *D. dorsalis* emerged.

NOSEMA ATTACKING FRUIT FLIES—Mr. Hagen reported that difficulty had been experienced recently in the experimental breeding of the three local species of tephritid fruit flies, due to an unidentified protozoan of the genus *Nosema*. The disease appears to be connected with a poor rearing medium. Study of the problem continues.

PHIDIPPUS AUDAX Hentz—Dr. Hardy reported that Dr. W. J. Gertsch identified this salticid spider among material sent to him last November. This is a new spider for the Hawaiian Islands. Although Dr. Gertsch did not report the locality of the specimens he named, practically the entire collection was from Honolulu. Dr. Gertsch says that "this is a spider of eastern United States and Mexico. . . ."

CHIRACANTHIUM sp.—Dr. Hardy reported a second case of spider bite involving this genus. On New Year's eve a man was bitten on the thumb while gathering clothes from a line at Kakaako, Honolulu. There was an immediate, intense stinging sensation, many times worse than a bee sting. The pain continued for hours and by evening a red streak extended up the arm from the bite, and a large lump had formed in the axillary region. That night the patient received emergency treatment at the hospital; lancing the site of the bite gave relief and rapid recovery.

[1] This is the species subsequently named *Opius vandenboschi* by Fullaway; see p. 413 of this issue of the "PROCEEDINGS." [Ed.]

ARGIOPE APPENSA Walckenaer – Dr. Hardy reported that this species seems to be generally distributed on Oahu. Mr. Haramoto brought in specimens in December from Kahaluu; previous records are from Waipio and Honolulu. Dr. Swezey added that he collected this spider on February 10 at Makaha in the Waianae district.

SCALE INSECTS ON ARAUCARIA—Dr. Hardy reported that Miss Adachi collected an unusual scale species recently on *Araucaria* in Manoa Valley, Honolulu, which was sent to Dr. G. F. Ferris for identification. Dr. Ferris reported as follows: "This is apparently an undescribed species belonging to the *Pseudoparlatoria* series, which strongly suggests that it is New World in origin, this group being very definitely neotropical. By greatly stretching the definition of the genus *Pseudoparlatoria* it can be put in that genus, although personally I would be inclined to regard it as a new genus. There have been a few species of *Pseudoparlatoria* described from South America, which are practically unrecognizable, but unless it is one of those it is new."

HOMONEURA UNGUICULATA (Kertész) –Dr. Hardy reported that this lauxaniid fly, the identification of which has been confirmed by C. W. Sabrosky, is common on Oahu and probably on the other islands also. It has obviously been here for years, but has not been recorded in our literature. Specimens are present in all of the local collections. Three specimens in the Bishop Museum have been determined by Malloch as this species. They are from Kalalau, Kauai, June 18, 1922, E. H. Bryan, Jr.; Waiahole, Oahu, May 30, 1920, E. H. Bryan, Jr.; and Old Parker place, Waimea, Hawaii, June 19, 1922, J. F. Illingworth. The genus was described as a *Lauxania* (Ann. Mus. Hungary, 11:100, 1913) from Formosa; no other distribution records have been found. It is possibly the species referred to by Grimshaw in "Fauna Hawaiiensis" as *Sapromyza* sp. (from "the Honolulu Mts., 1900"). It is also very probably the second species of *Homoneura* from Hawaii to which Malloch referred ("INSECTS OF SAMOA," 6, fasc. 4:208, 1929).

SCAPTOMYZA GRAMINUM Fallén—Dr. Hardy reported the following: This leafmining drosophilid has apparently not previously been recorded from the Territory. Several specimens were reared in January, 1951, by W. C. Mitchell from leaves of broccoli from Waimanalo, Oahu, where the fly was found to be abundant in and around broccoli fields. It is probably a recent immigrant, and no information is as yet available as to its economic importance. No specimens have been found in any of the collections in the Territory. Identification of this species was confirmed by Dr. M. R. Wheeler; the fly occurs in many parts of Europe, the continental United States and Canada.

ATHERIGONA HENDERSONI Malloch—Dr. Hardy reported that this muscid fly, a new species in the Territory, has been turning up in large numbers in casein hydrolysate bait traps operated by Paul Gow in the Maunawili region of Oahu. This species can be recognized from all the other *Atherigona* in the literature, by having the apex of the wing smoky fumose. It was described from Henderson Island in the south Pacific (Ann. Mag.

Nat. Hist., 12 [9]:184, 1923) and was later recorded by Malloch from Upolu, British Samoa ("INSECTS OF SAMOA," 6, fasc. 3:158, 1929).

Dr. Hardy's identification of this insect was confirmed by C. W. Sabrosky. A series of specimens of *A. hendersoni* is in the H.S.P.A. collection, taken by Dr. Swezey in Manoa Valley, Oahu, the first record being January 30, 1949. A specimen was taken on a window at the University of Hawaii by Charles Yasuda.

MARCH 12, 1951

The 543rd meeting was held at the H.S.P.A. Experiment Station on Monday, March 12, at 2:00 p.m., with President Hardy in the chair.

Members present: Adachi, Bess, Bianchi, Bonnet, Bryan, Clagg, Defibaugh, Dresner, Finney, Fullaway, Hagen, Haramoto, Hardy, Ito, Kamasaki, Keck, Look, Marucci, Messenger, Mitchell, Nishida, Pemberton, Peterson, Rathburn, Ritchie, Rosa, Martin Sherman, Suehiro, Swezey, van den Bosch, Van Zwaluwenburg, Weber, Wellhouse and Yasuda.

Visitors: J. W. Beardsley, Dr. Walter Ebeling, Miss Shizuko Maeda, L. Schoening and Minuro Tamashiro. Mr. Beardsley and Mr. Tamashiro were nominated for membership.

PAPERS

Mr. Hagen presented Dr. R. L. Doutt's paper: "Two new Species of Anagyrus (Hymenoptera: Encyrtidae)"; Dr. Hardy presented his paper: "Flies Collected in Bait Traps."

NOTES AND EXHIBITIONS

OTOSTIGMA SCABER Porat—Dr. Swezey exhibited a specimen of this centipede caught in his residence in Manoa, Honolulu, the night of March 10. Previous records of it from Nuuanu and Kalihi, Honolulu, date back to 1946, but no mention has been made of its occurrence in houses. It is distinguished from the commoner *Scolopendra subspinipes* Leach by its much longer anal legs which are blue, ringed with white.

STENOPTILIA PARVA (Walsingham)—Dr. Swezey exhibited specimens of this recent immigrant plume moth. It first came to attention here on April 6, 1946, when reared from *Erigeron albidus* by C. J. Davis at Kilauea, Hawaii National Park. Mr. Davis also collected it abundantly in the same region in light traps in November and December, 1947. On Oahu it was taken in light trap at Waipio in December, 1946 and February, 1947. Identification was made by Mr. Zimmerman by comparing specimens with the type in the British Museum. The species was described from Mt. Shasta, California ("PTEROPHORIDAE OF CALIFORNIA AND OREGON": 55, 1880).

ARMYWORMS AND THEIR PARASITES—Mr. Weber reported that on a trip to Waikii, Hawaii, in February, three species of armyworms and cutworms

were found. In order of their comparative abundance there were: *Cirphis unipuncta* (Haworth), *Lycophotia margaritosa* (Haworth) and *Agrotis ypsilon* Rottenburg. All larvae were found under rocks. Ten species of parasites and predators were collected; of these, the flies, especially *Chaetogaedia,* were the most common. One adult *Chelonus* was taken and one larva parasitized by *Euplectrus* was found; a single cocoon each of *Meteorus* and *Hyposoter* was found under stones. The list follows:

Chaetogaedia monticola (Bigot)
Archytas cirphis Curran
Eucelatoria armigera (Coquillett)
Pterocormus koebelei (Swezey)
Pterocormus rufiventris (Brullé)
Euplectrus plathypenae Howard
Meteorus laphygmae Viereck
Chelonus texanus Cresson
Hyposoter exiguae (Viereck)
Calosoma blaptoides tehuacanum (Lapouge)

ATISSA OAHUENSIS Cresson—Mr. Weber called attention to this ephydrid fly, described from Oahu, but not previously noted in these "PROCEEDINGS." It was described (Trans. American Ent. Soc., 74:24, 1948) from material collected by Yoshinori Tanada at Kaneohe, January 25, 1945. It was taken earlier by Mr. Tanada at Kuliouou, May 31, 1943.

PLAGITHMYSUS CRISTATUS (Sharp)—Miss Suehiro exhibited specimens of this uncommon native longicorn collected in Makaha Valley, Oahu, February 19, on *Acacia koa* by E. J. Ford, Jr. On March 9 he found this species in all stages in a recently fallen koa log at an altitude of 1000 ft.

A NEW SCALE INSECT ON ARAUCARIA—Mrs. Defibaugh reported a new scale, collected on *Araucaria* sp. at Waipio, Oahu, February 1, 1951 by J. W. Beardsley. Specimens were sent to Dr. G. F. Ferris who reports that the species is apparently new, and of a genus hitherto unreported from these Islands, *Octaspidiotus* Macgillivray. The genotype, *O. subrubescens* (Maskell), is from Australia.

AIOLOPUS TAMULUS (F.)—Mr. Pemberton exhibited specimens of this grasshopper collected by N. L. H. Krauss on Canton Island in September 1950. This is apparently the first record of its occurrence on Canton. It is known from Persia and extends through India and parts of Indo-Malaya to Formosa, Australia and some of the Pacific islands, particularly Samoa, Tonga and the Marianas. In Java it attacks cotton, rice, maize and other grains, sugar cane and *Sesbania.* From April, 1940 to December, 1941, the H.S.P.A. maintained an entomologist on Canton Island continuously. Careful surveys of the insects occurring there during this period did not reveal this grasshopper's presence. Dammerman ("THE AGRICULTURAL ZOOLOGY OF THE MALAY ARCHIPELAGO": 125, 1929) states that this is one of the few grasshoppers attracted to lights at night. The frequent arrival of aircraft at Canton Island since December, 1941, from

areas where the species occurs, may account for its appearance on that island, especially in view of its phototropic habit at night. It will be remarkable if it does not reach Hawaii in planes en route to Honolulu that almost nightly refuel at Canton under flood lights.

INSECTS AS MEDICINE—Dr. Dresner told of observations in a local store which sells herbs and certain insects, used by the old-generation Chinese for specific ailments. Among the material offered for sale were phalaenid larvae from China killed by the entomogenous fungus *Cordyceps robertsi*; the exuviae of a cicada which are mixed with herbs to make a tea; and dried scorpions, also used as an ingredient in tea. Essig ("COLLEGE ENTOMOLOGY": 314, 1942) mentions the use of a Chinese cicada, *Huechys sanguinea* (Degeer) as a vesicant.

PACHYNEURON SYRPHI (Ashmead) — Mr. Bianchi exhibited a series of both sexes of this pteromalid, about 50 of which had emerged from the chrysalis of the butterfly, *Vanessa cardui* (L.) collected on February 13 at Waikii, Hawaii. No evidence of any other parasite was found within the chrysalis, so it is assumed that in this case *Pachyneuron* acted as a primary parasite. In any case, the rearing of it from a butterfly chrysalis, whether primary or secondary, appears to constitute a new record of parasitism. *Pachyneuron allograptae* Ashmead is a synonym of *A. syrphi*.

ANTHRENUS FLAVIPES LeConte—Mr. Bianchi exhibited a series of beetles found by Mr. Keck damaging brush bristles in a naval warehouse at Pearl Harbor, which he identified as *Anthrenus vorax* Waterhouse. Subsequently, in a posthumous note (The Coleopterists' Bull., 5:45, 1951), H. S. Barber showed that the insect known as *A. vorax* Waterhouse is *A. flavipes* LeConte. Mr. Peterson remarked that specimens identified as *A. vorax* by the U. S. National Museum were collected at Pearl Harbor in June or July, 1950. Although a cosmopolitan insect, this species has not previously been recorded from the Hawaiian Islands.

SPHINOGOLABIS HAWAIIENSIS (Bormans) —Mr. Marucci presented the following notes on this earwig. An adult female found in rotten guavas at Waiahole was brought into the laboratory. After four days three 1st-instar nymphs, all showing some growth distension, were observed in the container with the adult. This suggested either an extremely short incubation period, or viviparous reproduction, so the female was subjected to closer observation. In the next 12 days she produced 10 living young, though none was actually seen in the process of being extruded from the parent. However, two of the nymphs were seen not more than 15 minutes after birth. This appears to be an authentic case of ovo-viviparous reproduction. Although the literature records viviparous reproduction in the suborder Arexinina, an anomalous group living ectoparasitically on birds, bats and rats, no reference could be found to reproduction of this type among the terrestrial earwigs.

PSEUDOCOCCUS BREVIPES (Cockerell) —Dr. Sherman reported finding the pineapple mealybug infesting sweet potatoes on the University campus on February 20. This appears to be a previously unreported hostplant for

the species. The mealybugs were found in all stages of development on stems above and below the surface of the soil, on the roots and within the abandoned tunnels of the stem-borer moth, *Omphisa anastomosalis* (Guenée). Closely associated with the mealybugs were colonies of the big-headed ant, *Pheidole megacephala* (F.).

MEALYBUG PARASITES AND ARGENTINE ANT—Mr. Ito reported that two encyrtid parasites of the pineapple mealybug, *Pseudococcus brevipes* (Cockerell), had been bred from material collected February 13 at Opaeula, Oahu. The material was from heavily infested first ratoon pineapple fruits on which the mealybugs had been fostered by the Argentine ant. The parasites were *Hambletonia pseudococcina* Compere and *Euryrhopalus pretiosa* (Timberlake), which emerged from apparently gravid *P. brevipes* females caged on pineapple leaves for purposes of a wilt test. Evidently parasitism was fairly common, for several cages were involved, and in a few cases as many as 3 out of 5 females per cage yielded parasites.

AMMOPHORUS INSULARIS Boheman — Mr. Van Zwaluwenburg said that he had found this tenebrionid in considerable numbers under stones at Molokai airport, February 14, 1951. This appears to be a new island record, the beetle being known here previously only from Oahu and Hawaii.

APRIL 9, 1951

The 544th meeting was held at the H.S.P.A. Experiment Station on Monday, April 9, at 2:00 p.m., with President Hardy in the chair.

Members present: Adachi, Beardsley, Bess, Bianchi, Defibaugh, Dresner, Finney, Fullaway, Hagen, Hardy, Hu, Kamasaki, Keck, Messenger, Nishida, Pemberton, Ritchie, Rosa, Steiner, Suehiro, Swezey, Tamashiro, Thomsen, van den Bosch, Van Zwaluwenburg, Weber and Wellhouse.

Visitor: Frank E. Skinner.

J. W. Beardsley and Minuro Tamashiro were unanimously elected to membership.

NOTES AND EXHIBITIONS

PINNASPIS BUXI (Bouché)—Dr. Swezey exhibited specimens of this scale on a leaf of *Anthurium magnificum* from his residence in Manoa. Apparently this is the first record of this species on *Anthurium*. Dr. Swezey's specimens were from a single large leaf, the only one infested on the plant; no other infested plants were found in the vicinity.

PARANACRYPTUS LACTEIPENNIS (Cameron)—Mr. Weber exhibited a specimen of this rarely collected chalcid, taken on a window at Waimanalo, Oahu, on February 5. It was described (Trans. Ent. Soc. London: 187, 1883) from Oahu in the genus *Epitranus*.

PROTAETIA FUSCA (Herbst)—Mr. Weber reported pigeon pea as a new hostplant of adults of this cetoniine. Considerable damage was done to bushes in the Damon Tract, Honolulu, where the beetles chewed through buds to get at the ovaries. In discussion, it was said that this insect has been found in numbers in the Kaimuki district of the city.

LEIOLOPISMA METALLICUM (O'Shaughnessy)—Mr. Pemberton stated that in a recent letter, Dr. F. X. Williams wrote that the immigrant skink recorded as *Leiolepisma hawaiiensis* Loveridge ("PROCEEDINGS," 12:225, 1945), has been synonymyzed under *L. metallicum*. This species is known from South Australia, Victoria, New South Wales, the Loyalty Islands and the New Hebrides, as well as from Oahu. It will be noted that the generic name has been incorrectly spelled in our local records.

TELENOMUS NAWAI Ashmead—Mr. Bianchi reported that an egg-cluster of *Laphygma exempta* (Walker), collected April 6 on the H.S.P.A. grounds, and incidentally, the first such egg mass seen on Oahu for some years, yielded a large number of adults of this proctotrupid egg parasite. This record demonstrates the ability of the parasite to persist even when host material is extremely scarce.

MIDWAY ISLAND INSECTS—Mr. Keck reported finding woodwork on Midway Island on a recent visit there, March 21-27, infested by the drywood termite, *Cryptotermes brevis* (Walker). This is a new island record; he also found the ant, *Pheidole megacephala* (F.), there.

Dr. Hu reported identifying as *Culex quinquefasciatus* Say, adult mosquitoes collected indoors on Midway by Mr. Keck on March 24. This appears to be the first record of mosquitoes on Midway, although in the H.S.P.A. collection there is a series of *C. quinquefasciatus* from Midway collected by F. C. Hadden in June, 1937.

CALOTERMES FROM CANTON ISLAND—Mr. Van Zwaluwenburg reported that type material of *Calotermes curvithorax* Kelsey from Canton Island ("PROCEEDINGS," 13:207, 1948) was submitted to Dr. A. E. Emerson of the University of Chicago. In Dr. Emerson's opinion *C. curvithorax* is a synonym of *Kalotermes immigrans* Snyder, a species known not only from Hawaii, but also from Ecuador, the Galapagos, the Marquesas and the Line Islands.

PSEUDIASTATA PSEUDOCOCCIVORA Sabrosky—Attention was called to the recent description of this drosophilid, predaceous on *Pseudococcus brevipes* (Cockerell) (Bull. Ent. Research, 41:624, 1950). According to the author, "This is undoubtedly the species which was introduced (as *P. nebulosus*) into Hawaii on several occasions between 1924 and 1932 for the control of the pineapple mealybug." Local notes on *Pseudiastata nebulosa* Coquillett ("PROCEEDINGS," 8:434, 456; 10:30, 352) actually refer therefore to *P. pseudococcivora*. Its introduction into Hawaii seems to have failed.

GONOCEPHALUM ADPRESSIFORME Kaszab—Mr. Van Zwaluwenburg called attention to the description of this tenebrionid from Luzon, Oahu and

Canton Island (Ann. Mag. Nat. Hist., 12th ser., 4, no. 38:182, 1951). This beetle, long confused here with *G. seriatum* (Boisduval), is certainly an immigrant to Oahu and Canton Island. The first specimens were taken here by Owen Bryant in Honolulu, February 8, 1932; it has been taken frequently since, but only on Oahu. The first Canton Island specimens were taken by Dr. P. M. Corboy on January 14, 1951, when the adult beetles were reported in great numbers inside buildings there. In the H.S.P.A. collection are two specimens of *G. adpressiforme* from Macassar, Celebes, collected by the late Dr. F. Muir in 1909, and a long series from Guam, taken by Dr. O. H. Swezey in 1936. These latter were erroneously recorded as *G. seriatum* ("INSECTS OF GUAM," I:165, 1942); another species, *G. incisum* (Blanchard), was recorded from Guam by K. G. Blair (l.c.:56) but this material was not seen by Dr. Swezey.

Mr. Mitchell and Dr. Newell observed damage by *G. adpressiforme* to young cucumber plants at Waimanalo ("PROCEEDINGS," 14:220, 1951). The species is somewhat smaller than *G. seriatum,* but is most easily distinguished from the latter by its shiny scutellum.

NEW SPIDER RECORDS—Dr. Hardy reported the identification of three spiders new to the Hawaiian Islands, made by Dr. W. J. Gertsch from material collected early in 1951. These are:

Coleosoma blandum Cambridge. Honolulu, Oahu, D. E. Hardy; tropicopolitan in distribution. Family Theridiidae.

Conopistha sp. Waimanalo, Oahu, Frank Haramoto; Kamuela, Hawaii, March, 1951, W. C. Mitchell and H. A. Bess. This small species is commensal, living in webs of other spiders (*Argiope,* for example) in the peripheral portion of the larger spider's web, where they form a small tangle of their own. Family Theridiidae.

Eperigone sp. Under rock, Manoa Valley, Oahu, D. E. Hardy. An American genus of the family Linyphiidae.

CHIRACANTHIUM sp.—Dr. Hardy reported that this spider is obviously widespread on Oahu. It has now been taken at Waimanalo, Kawailoa and Lualualei, as well as in Honolulu and the Pearl Harbor area.

MAY 14, 1951

The 545th meeting was held at the H.S.P.A. Experiment Station on Monday, May 14, at 2:00 p.m., with President Hardy in the chair.

Members present: Adachi, Alicata, Beardsley, Bess, Bianchi, Bryan, Chong, Defibaugh, Finney, Fullaway, Hagen, Haramoto, Hardy, Kamasaki, Look, Marucci, Mitchell, Newell, Nihei, Nishida, Pemberton, Rathburn, Martin Sherman, Suehiro, Swezey, Tamashiro, Thomsen, van den Bosch, Van Zwaluwenburg and Wellhouse.

Visitors: Alan P. Dodd, H. D. Kirschman and Miss Shizuko Maeda.

NOTES AND EXHIBITIONS

ORIUS PERSEQUENS (White).—Dr. Swezey exhibited specimens of this anthocorid, collected at Makaha, Oahu, May 5, and commented on its abundance in flower heads of *Verbesina encelioides,* a yellow-flowered composite common in waste places in the western and southwestern lowlands of this island. The prey of this bug in the flowers was an undetermined thrips which is new to Hawaii, according to Mr. Bianchi. The thrips was even more abundant than the bug. Until transferred to *Orius,* it was known under its original name, *Triphleps.*

NEW RECORDS AND NAME CHANGES IN HAWAIIAN EPHYDRIDAE.—Miss Adachi exhibited a collection of ephydrid flies identified by Dr. W. W. Wirth, from which are compiled the following notes:

Hecamede persimilis Hendel (Synonym: *H. femoralis* Malloch, see Cresson 1948, Trans. Amer. Ent. Soc., 74:23).
Mokapu, Oahu, Sept. 5, 1923, E. H. Bryan, Jr. (det. *femoralis* by Malloch) (USNM) 1 female.
Kahoolawe Is., east end, 900 ft., Feb. 14, 1931, E. H. Bryan, Jr. (det. *albicans* by Aldrich) (USNM) 1 female. *H. albicans* (Meigen) of Bryan's list ("PROCEEDINGS," 8:399-468, 1934) refers to *persimilis;* the true *albicans* is European.

Atissa oahuensis Cresson (Trans. Amer. Ent. Soc., 74:24, 1948) (type locality Tuna Packer's Pond, "Kaneghei" [? Kaneohe], Oahu. This species has until now been omitted from the lists of new insect records in these "PROCEEDINGS." Additional records:
Kaneohe, Oahu, March 13, 1947, Wirth (ex dump) 1 male, 1 female (USNM).
Kahuku, Oahu, Feb. 1, 1946, Wirth (light trap), 1 male (USNM).
Kalihi, Oahu, July 2, 1946, Wirth (hyacinth-choked ditch) 1 female (USNM).

Gymnopa grandis Cresson. Taken along beaches on *Scaevola;* Oahu.

Gymnopa tibialis (Cresson); a very common North American species.
Mapulehu, Molokai, August 25, 1944, Y. Tanada, 1 female (USNM).

Discocerina mera (Cresson); described from Formosa; common across the Pacific.
Honolulu, Oahu, November 8, 1948, C. R. Joyce (USNM).

Clasiopella uncinata Hendel; described from Formosa; USNM material from Guam and Midway; very common on airplanes.
Kailua, Oahu, June 1, 1946, Wirth (at window near beach), 1 male, 3 females (USNM).
Honolulu, Oahu, Naval Air Station, January 8, 1946, Wirth (at plane window), 1 male, 1 female (USNM).
Honolulu, Oahu, April, 1951, Ala Wai canal, on vegetation.

Hostis guamensis Cresson; previously known only from Guam.
Lanikai, Oahu, December 29, 1945, Wirth (intertidal rocks, beach), 1 female (USNM).
Ewa, Oahu, March 15, 1946, Wirth (resting on seaweed on beach), 1 female (USNM).

Ceropsilopa coquilletti Cresson; a nearctic and neotropical species.
Ewa, Oahu, March 15, 1946, Wirth (swept, edge of pond) (USNM).
Honolulu, Oahu, Ala Wai, on vegetation, April, 1951.

Notophila insularis Grimshaw; this is not a *Paralimna* as indicated by Malloch and recorded by Bryan (l.c.: 455).
Waikiki, Oahu, September 27, 1918, J. C. Bridwell (USNM).

A NEW CANACEID FROM OAHU—Miss Adachi reported that Dr. Wirth had determined a fly taken at Hanauma Bay, Oahu, on rocks, early April, 1951, as *Placopsidella cynocephala* Kertész. This is a new record for the Hawaiian Islands; the species was described from New Guinea.

HOROGENES (DIOCTES) CHILONIS (Cushman)—Mr. Pemberton stated that he recently reared this ichneumonid from a larva of the coconut leaf-roller, *Omiodes blackburni* (Butler), from Lahaina, Maui, on April 9. This is a new host record for this parasite.

ANOLIS CAROLINENSIS Voight—The green lizard that has been seen occasionally in the Kaimuki district of Honolulu for the past 15 years, appears to fit the description of this species very well, according to Mr. Pemberton. It has not previously been reported from the Hawaiian Islands. Two living specimens were brought in from Kaimuki on April 26. Raymond L. Ditmars ("THE REPTILES OF NORTH AMERICA": 23, 1940) states that the species ranges from North Carolina southward throughout Florida, and westward to the Rio Grande in Texas. It is commonly known as the American chameleon.

TRIATOMA RUBROFASCIATA (Degeer)—Mr. Pemberton said that on April 30, two adults of this reduviid bug were caught in a light trap operated about one-quarter mile south of the Ewa Plantation mill on Oahu. This is the third time this insect has been taken in the Pearl Harbor region, and the first time at Ewa.

PSEUDOCOCCUS GALLICOLA Ehrhorn—Mr. Fullaway reported finding galls of this coccid on a seedling plant believed to be a *Santalum*, collected recently by Mr. Crosby on the Aiea trail. The mealybugs were parasitized by an undescribed species of *Anagyrus*.

AMYNA NATALIS (Walker)—Mr. Bianchi reported an unusually heavy infestation by this phalaenid moth on ilima (*Sida fallax*) at Lualualei, Oahu, during the latter half of April. From 107 caterpillars collected in three lots on successive weeks, emerged 17 adults of the tachinid, *Eucelatoria armigera* (Coquillett). This material also produced 2 cocoons of *Meteorus laphygmae* Viereck, but it is not certain that they issued from the *Amyna*.

BRACHYMERIA OBSCURATA (Walker)—Mr. Van Zwaluwenburg reported breeding this chalcid from the pupa case of the ichneumonid, *Hyposoter exiguae* (Viereck). The cocoon was collected at Lualualei, Oahu, April 24, from a heavy infestation of *Amyna natalis* (Walker), where two weeks earlier there had also been an outbreak of *Heliothis armigera*

(Hübner) on *Sida*. Three other *Hyposoter* cocoons were found on foliage in the same area, and all had been hyperparasitized.

TRICHOGRAMMA PARASITIZING EGGS OF HYMENIA—Dr. van den Bosch reported that during the course of recent studies on the Hawaiian beet webworm, *Hymenia recurvalis* F., many eggs of this moth showed evidence of parasitization. Several egg clusters were then held, and from them issued adults of *Trichogramma evanescens* Westwood (determined by Dr. S. E. Flanders). Parasitization ran as follows:

Locality	Date	No. of Eggs		Percentage Parasitization
		Not Par.	Parasitized	
Insectary	Apr. 1	14	23	62.2
"	Apr. 11	6	45	82.2
Mid-Pacific area	Apr. 13	17	13	43.3
" "	Apr. 19	4	46	92.0

From these data it appears that *Trichogramma* can parasitize a high percentage of *Hymenia* eggs. However, a true evaluation of the benefits derived from this parasite can be had only after thorough study. The high parasitization at the insectary on April 11 and at Mid-Pacific school on April 19, occurred when oviposition activity of the moths had passed its peak. It is thus possible that only the "tail-end" eggs of each host brood are heavily affected, and that *Trichogramma* may not be so effective as at first appears. This possibility is heightened by the rather heavy larval population that existed in the Mid-Pacific sampling area at the time the eggs were collected. Nevertheless, *Trichogramma* is a welcome addition to the parasite complex affecting the beet webworm in Hawaii.

FUNGUS ATTACKING SWEETPOTATO WEEVILS—Dr. Sherman reported that a fungus was recently found infesting a culture of the sweetpotato weevil, *Cylas formicarius elegantulus* (Summers) in the laboratory. Fresh cultures of this species and of *Euscepes postfasciatus* (Fairmaire) were inoculated, and the fungus killed all individuals of both species. The fungus was identified by Dr. E. A. Steinhaus as *Beauveria* sp., probably *B. bassiana* or *B. globulifera*.

APHANIOSOMA SP.—Dr. Hardy reported that he had collected a single specimen of a chryomyid fly at Kawela Bay, Oahu, May 18, 1951. This fly has been tentatively identified by Dr. M. R. Wheeler, of the University of Texas, as *Aphaniosoma*, perhaps *thoracalis* Hendel, described from Formosa (Suppl. Ent. Berlin, 2:111, 1913). The genus is new to the Hawaiian Islands.

NOTES ON PHORIDAE—Dr. Hardy commented on a preliminary report by Father Thomaz Borgmeier of Rio de Janeiro on a collection of phorid flies. Identifications were:

Diploneura peregrina (Wiedemann); Tantalus, Oahu, 2, H.S.P.A. collection. "A very striking species with anterodorsal and anteroventral spines on hind tibiae."

Pericyclocera n. sp. A series was reared from *Achatina fulica* at Batavia, Java, June 9, 1945, by Dr. P. Van Weel. Acording to Dr. Van Weel's observations, the fly is parasitic on the giant African snail in Java. This fly does not occur in Hawaii.

Megaselia scalaris Loew (Synonym *Aphiochaeta xanthina* Speiser); from a number of localities on Oahu.

Megaselia sp. 1; reared from grasshoppers and from *Thecla echion* (L.), Honolulu, June 1945, December 1950 and January 1951. (C. Yoshida, D. D. Jensen and D. E. Hardy.)

Megaselia sp. 2; ex dead moth, Honolulu.

Megaselia sp. 3; no data available; the unique was not returned.

Puliciphora sp.; from fruit fly cultures, Honolulu, December 1950 (E. Dresner).

Chonocephalus sp. 1; Waimanalo, Oahu, January 1951; from bait trap (Paul Gow).

Chonocephalus sp. 2; ex meat, Honolulu, January 1928 (O. H. Swezey).

The genera *Diploneura* and *Chonocephalus* are here reported from the Hawaiian Islands for the first time.

Mr. Alan P. Dodd gave an interesting account of the cactus control project in Australia.

JUNE 18, 1951

At the invitation of the Director of the B. P. Bishop Museum, the 546th meeting of the Society was held at the Bishop Museum, June 18, at 2:00 p.m., with Vice-President Bess in the chair.

Members present: Alicata, Bess, Bianchi, Bryan, Chilson, Defibaugh, Dresner, Ford, Fullaway, Haramoto, Kamasaki, Keck, Look, Marucci, Mitchell, Nishida, Pemberton, Rosa, Martin Sherman, Smith, Suehiro, Swezey, Tamashiro, van den Bosch, Van Zwaluwenburg and Weber.

Visitors: Miss Helen L. S. Au, Otto Degener, Mrs. Janice Ford, C. F. Henderson, H. D. Kirschman, Pat Nakagawa and Carl M. Yoshimoto.

Miss Helen Au of the University of Hawaii was nominated for membership.

PAPERS

F. A. Bianchi presented his paper: "Additions to the Thysanoptera of New Caledonia"; D. T. Fullaway presented his: "New Species of Opius (Hymenoptera: Braconidae)"; also presented were: "The Immature Stages of Sessinia livida (Fabricius) (Coleoptera: Oedemeridae)," by E. A. J. Duffy, and "A Comparative Study of Spermatozoa in Relation to the Classification of Mealybugs," by Richard L. Doutt.

NOTES AND EXHIBITIONS

INSECTS FROM DECAYING BLOSSOMS—Dr. Swezey reported on insects he had reared from water contained in the axils of the large bracts of decaying *Heliconia* blossoms. The following were reared to adults from larvae:

Drosophila spinofemora Patterson and Wheeler
Drosophila mercatorum Patterson and Wheeler
Drosophila hydei Sturtevant
An undetermined winged phorid fly
An undetermined wingless phorid
Psychoda sp. (Psychodidae)
Atherigona excisa trilineata Stein (Anthomyiidae)
Volucella hoya Curran (Syrphidae)
Desmometopa m-nigrum Zetterstedt* (Milichiidae)

In addition, live adults of the hydrophilid beetle, *Dactylosternum abdominale* (F.), and of a tiny black trichopterygid beetle, were taken in the water.

PROTAETIA FUSCA (Herbst)—Dr. Pemberton reported that a single adult of this cetoniine beetle was taken on a corn plant at Waipio, Oahu, on May 31 by B. K. Nishimoto. This is the first record of the occurrence of this species west of Pearl Harbor.

FULVIUS BREVICORNIS (Reuter)—Dr. Pemberton reported that 13 specimens of this mirid bug were caught in a light trap south of the Ewa Plantation mill, Oahu, during May and June, 1951. One specimen had previously been taken in a light trap at Iroquois Point, Oahu, July 30, 1947 ("PROCEEDINGS," 13:213, 1948). These later captures indicate that the species is definitely established on Oahu.

RELATIVE ABUNDANCE OF NATIVE BEETLES—Mr. Ford presented the following: Popular opinion seems to be that many of the endemic insects have become either rare or extinct; this may be true in some cases. During the past year or so Mr. Ford has devoted some 200 hours in the Oahu forests (mainly on the Waianae range) to collecting native beetles on the average of once every two weeks. The following list of his captures indicates two points: (1) endemic Coleoptera are not rare, in general; and (2) the same species that were common 50 years ago are still the most common; those that were rare then are still rare:

* See note on *D. tarsalis* Loew, p. 474.

Family	Species	Where Taken	No. Adults
CARABIDAE	**Metrothorax curtipes** Sharp	In moss clumps	1
	Colpocaccus sp.	Under dead "ohia" log	1
	Atelothrus metromenoides Perkins	Moss clumps	2
	Metromenus epicurus (Blackburn)	Under stones	8
	Metromenus fraternus (Blackburn)	Moss clumps	6
	Mesothriscus musicola (Blackburn)	" "	1
	Chalcomenus corruscus (Erichson)	" "	3
DYTISCIDAE	**Copelatus parvulus** (Boisduval)	Mountain streams	10
	Rhantus pacificus (Boisduval)	Still water	10
STAPHYLINIDAE	2 undet. spp.	Decayed fungus	2
HYDROPHILIDAE	**Limnoxenus semicylindricus** (Eschscholtz)	Aquatic	1
ELATERIDAE	**Itodacnus gracilis** Sharp	Dead "ohia"	1
EUCNEMIDAE	**Dromaeolus** sp.	" "	1
NITIDULIDAE	**Orthostolus prosternalis** Sharp	*Pipturus* twig	1
CUCUJIDAE	**Parandrita aenea** (Sharp)	Beating "ohia"	1
ANOBIIDAE	**Mirosternus punctatissimus** Perkins	At light	1
	2 undet. spp.	*Pipturus albidus*	2
	8 undet. Cis spp.	Bracket fungi	47
CERAMBYCIDAE	**Aegosoma reflexum** Karsch	Rotting "koa"	3*
	Parandra puncticeps Sharp	Rotten *Aleurites*	3
	Plagithmysus cristatus (Sharp)	*Acacia koa*	8
	Plagithmysus pulverulentus (Motschulsky)	*Acacia koa;* mango	13
	Neoclytarlus euphorbiae Bridwell	*Euphorbia multiformis*	110
	Neoclytarlus sp.	*Mangifera indica*	1
CURCULIONIDAE	**Pentarthrum prolixum** Sharp	*Cibotium* sp.	15
	Dryophthorus distinguendus Sharp	*Aleurites moluccana*	15
	8 undet. **Dryophthorus** spp.	Various native plants	52
	Oodemas angustum Blackburn	*Pipturus albidus*	10
	Oodemas aenescens Boheman		1
	Anotheorus montanus Blackburn	*Metrosideros*	12
	Xyleborus spinosulus Schedl (doubtfully endemic)	*Citrus* sp.	1
	5 undet. **Proterhinus** spp.	*Pipturus; Cibotium*	39
	3 undet. **Hypothenemus** spp.	*Euphorbia; Citrus*	33

* Larvae.

NEW KAUAI INSECT RECORDS—Mr. Weber reported that Stephen Au had collected the weevil, *Orchidophilus peregrinator* Buchanan, January 16, 1951, at Koloa, Kauai, on *Dendrobium gouldii,* and bred the syrphid fly, *Volucella hoya* Curran, from "decayed gourd," from Waimea, Kauai, March 7, 1951. Both are new records for Kauai.

MEALYBUG NOMENCLATURE—Mrs. Defibaugh called attention to Dr. G. F. Ferris' recent revision of the genus *Pseudococcus* ("SCALE INSECTS OF NORTH AMERICA," ser. V—The Pseudococcidae, Pt. I, 1950) in which changes are made in the generic standing of some economically important mealybugs in Hawaii. The pineapple mealybug, *P. brevipes* (Cockerell) becomes the genotype of *Dysmicoccus* Ferris, to which also is assigned the gray mealybug of sugar cane, *P. boninsis* (Kuwana). The pink mealybug of sugar cane, *Trionymus sacchari* (Cockerell), becomes the genotype of the monotypic *Saccharicoccus* Ferris, and *Pseudococcus nipae* (Maskell), the genotype of *Nipaecoccus* Ferris. *Pseudococcus citri* (Risso) and *P. kraunhiae* (Kuwana) are removed to *Planococcus* Ferris.

It is of interest to note that Dr. Doutt's paper (pp. 391-397 of this issue of the "PROCEEDINGS") showing structural differences in the spermatozoa of the genera in question, supports, with one exception, Ferris' new groupings of these mealybug genera.

POPILLIA JAPONICA Newman—Mr. Ford reported that a living adult of the Japanese beetle had been taken from a MATS plane arriving at Hickam Field early in June. The cargo of the plane had originated in Georgia, in an area where the beetle is known to occur.

JULY 9, 1951

The 547th meeting was held at the H.S.P.A. Experiment Station on Monday, July 9, at 2:00 p.m., with Vice-President Bess in the chair.

Members present: Helen Au, Balock, Beardsley, Bess, Bianchi, Bonnet, Bryan, Carter, Chilson, Defibaugh, Fullaway, Haramoto, Hu, Keck, Look, Newell, Nishida, Pemberton, Rosa, Schmidt, Steiner, Suehiro, Swezey, Tamashiro, van den Bosch and Van Zwaluwenburg.

Miss Helen Au was unanimously elected a member of the Society; the name of Leroy D. Christenson was nominated for membership.

NOTES AND EXHIBITIONS

A GYNANDROMORPH OF XYLOCOPA—Dr. Bonnet exhibited a gynandromorph of the carpenter bee, *Xylocopa varipuncta* Patton, collected at Kailua, Oahu, by Leonard Higbee on June 26. The normal female is jet black with dark iridescent wings, while the male is smaller, is a tawny brownish yellow and has transparent wings. This gynandromorphic specimen was yellowish on the left half, and black on the right; the left eye and left palpus were smaller than their counterparts on the other side of the body. The species is an immigrant from the southwestern United States and is found throughout the lowlands of these islands. Another example showing similar bisexual coloration was collected in 1927 ("PROCEEDINGS," 7:22, 1928).

PNEUMONYSSUS CANINUM Chandler and Ruhe—Dr. Bonnet reported a series of this mite taken from the frontal sinuses and turbinales of a dog, in March, 1951, by Dr. R. F. Cross, veterinarian of the Territorial Board of Agriculture & Forestry, while autopsying the dog from Kailua, Oahu, following its death from a leptospiral infection. There was no sign of irritation of the membranes and it is not believed that these mites contributed to the animal's death. The specimens were identified by Dr. E. W. Baker of the U. S. National Museum. The species was described from Michigan (JOURN. OF PARASITOLOGY, 26:59-70, 1940). Additional references to this mite can be found in articles by W. S. Monlux (CORNELL VET., 30:252, 1940) and by Monlux and Turk (idem, 61:12, 1951). The mite apparently causes no discomfort to the dog, and produces no pathological condition. This is the first record of the species in Hawaii.

CHRYSIS FUSCIPENNIS Brullé—Dr. Pemberton said that his tentative identification of this immigrant chrysidid, which was first captured in Honolulu, October 14, 1949 ("PROCEEDINGS," 14:18, 1950) had been confirmed by Karl V. Krombein of the U. S. National Museum.

CANTHON HUMECTUS (Say)—Mr. Van Zwaluwenburg reported that this scarabaeid, imported from Mexico to reduce hornfly populations, was present in great numbers near Waikii, Hawaii, on June 27. It was first seen on the highway, and later found exceedingly numerous in pasture grass. Richard Penhallow, of the Parker Ranch, stated that at the present time hornfly is much reduced in parts of the ranch. With *C. humectus* as numerous as it was in late June, it is entirely possible that much of the reduction in hornfly population is due, in large part, to its work. The first recovery of the beetle after its introduction in 1923 was made at Waikii in 1947 by Dr. Swezey.

THRIPS ON ORCHIDS—Dr. Carter commented on the great numbers of thrips on *Vanda* orchids at the present time, particularly on plants growing outdoors. Mr. Bianchi said that the species is probably *Anaphothrips corbetti* Priesner, a species first reported in the Territory in November, 1950.

SCALE INSECTS AND ARGENTINE ANT—Dr. van den Bosch told of finding, in June, the following scale insects on guava bushes on Drum Drive (Highway 135) at Opaeula gulch, Oahu, all being attended by the Argentine ant. The coccids were identified by Mrs. Defibaugh as:

Hemiberlesia lataniae (Signoret)
Coccus viridis (Green)
Pseudococcus nipae (Maskell)
Saissetia nigra (Nietner)

It was interesting, incidentally, to discover later that some of the *Pseudococcus nipae* were parasitized by the introduced encyrtid, *Pseudaphycus utilis* Timberlake. It is remarkable how this parasite persists during the many years that its host has been so extremely scarce.

AUGUST 13, 1951

The 548th meeting was held at the H.S.P.A. Experiment Station on Monday, August 13, at 2:00 p.m., with Vice-President Bess in the chair.

Members present: Adachi, Beardsley, Bess, Bonnet, Chong, Christenson, Defibaugh, Fullaway, Haramoto, Hinman, Hu, Keck, Look, Messenger, Mitchell, Newell, Nishida, Ritchie, Martin Sherman, Suehiro, Swezey, Tamashiro, Tuthill and Van Zwaluwenburg.

Visitors: Dr. J. R. Arnold, H. D. Kirschman and R. O. Parsons.

Leroy D. Christenson was elected a member of the Society.

PAPER

Mr. Van Zwaluwenburg presented his paper: "New Species and new Records of Elaterid Beetles from the Pacific—IV."

NOTES AND EXHIBITIONS

HIPPODAMIA 5-SIGNATA PUNCTULATA LeConte—Miss Adachi exhibited a coccinellid beetle which, on comparison with material named by Dr. F. X. Williams, appears to be this species. It was taken inside a store window in Honolulu and is obviously an immigrant on imported vegetables. Mr. Look remarked that last year great numbers of *Coccinella californica* Mannerheim accompanied importations of celery, but that, unfortunately, the beetle has not yet become established here.

OPIUS KRAUSSI Fullaway—Miss Chong reported that a specimen of this braconid parasite was bred at Kula, Maui, from *Dacus cucurbitae* Coquillett, in loquat, July 2, 1951, by Llewellyn Akaka. This is the first record of the field recovery of this Australian species in the Islands.

ANOMALON CALIFORNICUM (Cresson)—Mr. Fullaway exhibited a specimen of this ichneumonid taken in October, 1948, at Kawaihae, Hawaii. This is a new island record for this immigrant, which locally has been known from Niihau and Oahu.

A NEW GECKO—Mr. Fullaway reported that a gecko new to these Islands, *Gehyra oceanica* (Lesson), an immigrant from Polynesia or the southwest Pacific, was taken early in August, 1951, at McKinley High School, Honolulu, by Larry Silva. The lizard was identified by V. E. Brock of the Board of Agriculture and Forestry.

PLUSIA CHALCITES Esper—Mr. Keck exhibited a larva of the green garden looper, taken on mint at Pearl Harbor. It was parasitized by the polyembryonic encyrtid, *Copidosoma truncatellum* (Dalman), first introduced into Hawaii from America by Koebele in 1898. This parasite has hitherto been known in Hawaii under its synonym, *Litomastix floridana* (Ashmead).

EUMENES LATREILLEI PETIOLARIS (Schulz)—For Dr. Pemberton it was reported that the first authentic record of this eumenid from the island of Hawaii was of material taken in numbers near Kawaihae by Leslie Wishard, April 4, 1951. It has since been taken at Hamakua Mill and at Onomea on the same island.

NEW TIPULIDS FROM HAWAII—Attention was called to the recent description by C. P. Alexander, of three species of the tipulid genus *Limonia* (*Dicranomyia*) from the Hawaiian Islands (Ann. & Mag. Nat. Hist. [12] 4:583-587, 1951). They are *L. haleakalae* and *L. kraussi* from Maui, and *L. wainaensis* [sic] from Oahu.

HYPOCRYPHALUS MANGIFERAE (Stebbing)—Dr. Swezey supplemented earlier notes on this mango bark beetle ("PROCEEDINGS," 13:445, 1949),

identified by Dr. W. H. Anderson of the U. S. National Museum. When first found it seemed to be a rare insect, with records from only two places in Honolulu. Since then Dr. Swezey has collected a few specimens from time to time from dead mango twigs. Finally, in May, 1951, he cut a living branch from a mango tree and left it on the ground. By July the beetle was found in all stages in this branch, the larvae feeding in the decaying bark and in the outer surface of the wood, leaving grooves in the latter. Five hundred exit holes of this beetle were found per one foot length of branch (which was a little less than 2 inches in diameter); they averaged 7.5 holes per square inch of bark, with as many as 20 per square inch in some parts. Thus the entire population for the branch and its twigs would total many thousands, a demonstration that under favorable conditions, this scolytid can become excessively abundant. Although records are not available, it is probable that the species is widespread on Oahu and perhaps on the other islands as well. Observations on scolytids infesting mango twigs would be valuable, but care in the determination of such material is necessary because some small species of *Hypothenemus* are also likely to be found there.

SEPTEMBER 10, 1951

The 549th meeting was held at the H.S.P.A. Experiment Station on Monday, September 10, at 2:00 p.m., with President Hardy in the chair.

Members present: Adachi, Alicata, Beardsley, Bess, Bonnet, Chilson, Clagg, Clancy, Defibaugh, Haramoto, Hardy, Keck, Look, Messenger, Newell, Nishida, Pemberton, Roan, Rosa, Schmidt, Suehiro, Swezey, Tamashiro, Tuthill, van den Bosch and Van Zwaluwenburg.

Visitors: H. D. Kirschman and F. A. Morishita.

PAPER

C. J. Davis' paper was presented: "Some Observations on the Fern Weevil (Syagrius fulvitarsis Pascoe) in the Kilauea Volcano Region of Hawaii National Park, with Notes on Parasitism."

NOTES AND EXHIBITIONS

PARAGOGES MACULATUS LeConte—Mr. Ford reported that two specimens of this weevil had recently been taken on Oahu. One, in the latter part of 1950, was taken on Mr. Ford's clothing, outdoors, about 2 miles from the Naval Air base at Barber's Point, Oahu; the other, in July 1951 at the Honolulu airport aboard an aircraft which had been parked with open doors most of the day. It is suggested, but is by no means certain, that this insect is established on Oahu. The species is a native of California, where it is apparently uncommon; its host is unknown. Identification of Mr. Ford's specimens was made by comparison with material in the Bishop Museum, named by E. C. Zimmerman.

RECENT INSECT INTERCEPTIONS — Mr. Chilson reported the following major interceptions by Federal inspectors at the various airports on Oahu during the past three months. All specimens were taken alive on airplanes, and all originated in Japan, with the single exception noted:

Popillia japonica Newman; Honolulu airport, July 3, Mueller coll. Hickam Field, July 11, Stout coll.

Acrida turrita (L.); Hickam Field, August 12, Messersmith coll.

Protaetia orientalis Gory & Percheron; Honolulu airport, August 15, Messersmith coll.

Xylotrupes gideon (L.); from the Philippines; collected aboard plane by stewardess, Honolulu airport, August 12 (Greenfield).

Spondylus buprestoides (L.); Honolulu airport, in suitcase, August 23, Mueller coll.

INSECTS FROM BREADFRUIT BRANCHES—Dr. Swezey exhibited examples of *Scleroderma immigrans* Bridwell, bred from cerambycid larvae in dead branches of breadfruit, from which the cerambycids *Oopsis nutator* (F.) and *Pterolophia camura* Newman had issued. From the same material, and presumably parasitic on the cerambycids, a braconid also issued, *Rhaconotus vagrans* (Bridwell). This last insect has been known locally under the name *Hormiopterus*.

TACHYPOMPILUS ANALIS (F.)—Mr. Rosa exhibited a cocoon collected at Oahu Sugar Co., August 30, which ultimately proved to be that of this immigrant Philippine psammocharid. The cocoon is strikingly like those of Scoliidae, but is considerably larger than that of the *"Scolia"* wasp introduced from the Philippines.

PROTAETIA FUSCA (Herbst)—Mr. Look said that adults of this beetle were recently found attacking blossoms, pods and stems of *Crotalaria saltiana* on Alewa Heights, Honolulu. Although more than a dozen beetles were attacking a single small plant, the damage was not severe.

GRAPTOSTETHUS MANILLENSIS (Stål)—Mr. Van Zwaluwenburg reported seeing numbers of this lygaeid bug on beach morning glory (*Ipomoea pes-caprae*) at Makaha, Oahu, September 3. Although no nymphs were seen it is suggested that this plant will prove to be an addition to the hostplant list of this species.

LAMPROLONCHAEA AUREA (Macquart)—Dr. Hardy reported a second specimen of this recently collected fly was taken on May 2 in Manoa Valley, Honolulu, by a University student. The first example of this species was collected by Paul Gow in January, 1951, at Maunawili, Oahu, in a fruit fly trap containing casein hydrolysate lure.

ISCHIODON PENICILLATUS (Hull)—Dr. Hardy reported that specimens collected by Mr. Krauss in October, 1950 on Canton Island, were determined as this species by F. M. Hull. The earlier record from Canton, of *Ischiodon scutellaris* (F.) ("PROCEEDINGS," 11:310, 1943), should be corrected to *I. penicillatus*.

OCTOBER 8, 1951

The 550th meeting was held at the H.S.P.A. Experiment Station on Monday, October 8, at 2:00 p.m., with President Hardy in the chair.

Members present: Adachi, Balock, Bess, Chilson, Christenson, Clagg, Defibaugh, Fullaway, Hardy, Kamasaki, Keck, Pemberton, Rosa, Swezey, Tamashiro, Tuthill, van den Bosch and Van Zwaluwenburg.

NOTES AND EXHIBITIONS

MAPSIDIUS CHENOPODII Swezey—Dr. Swezey exhibited a breeding jar with over 300 moths of this species, bred from the foliage of *Chenapodium oahuense* collected at Pohakuloa, Hawaii by C. J. Davis in September. The plants were heavily infested. Also bred from this material, and presumably parasitic on the *Mapsidius* larvae, were 6 ichneumonids, *Olesicampe* (formerly known as *Limnerium*) *blackburni* (Cameron), and 4 *Bracon terryi* (Bridwell).

NEOCLYTARLUS CLAVIGER (Sharp)—Dr. Swezey exhibited a specimen of this native longicorn collected by Mr. Davis on his person at Keanakolu, Hawaii, at about 5000 ft. elevation. The species is attached to *Acacia koa*. Until Dr. Swezey collected a specimen in 1931 at Keanakolu, it had previously been found only at Kilauea, on the island of Hawaii.

A NEW MANTID—Mr. Rosa exhibited male adults of a mantid identified by Dr. Pemberton as *Tenodera australasiae* (Leach), a species new to the Hawaiian Islands. It was first taken in a light trap at Ewa Plantation Co., Oahu, in mid-August, 1951.

DIAPERIS MACULATA Olivier—Mr. Rosa reported that three specimens of this tenebrionid had recently been taken in the Ewa Plantation light trap. Previously the only record of this species was an individual taken in light trap at Iroquois Point, Oahu, July 9, 1947. The recent captures make it apparent that the species is established on Oahu. [Subsequently, in November, 1951, a specimen was taken in light trap at Waialua Plantation Co., Oahu.]

PROCECIDOCHARES UTILIS Stone—Dr. Bess reported that following wet weather, this tephritid fly appears to be doing a good job of reducing growth of pamakani (*Eupatorium glandulosum*) at Ulupalakua, Maui, in spite of heavy parasitization.

ICERYA SEYCHELLARUM (Westwood)—Dr. Pemberton said that F. A. Bianchi collected specimens of this coccid on Tutuila, American Samoa, early in September, 1951. It was abundant on a long list of hostplants, both wild and cultivated, but was particularly bad on citrus, breadfruit and *Plumeria*. Some of the breadfruit trees were seriously damaged, and the Samoa Department of Agriculture reports that breadfruit is occasionally killed by this insect. This appears to be the first record of this insect in Samoa. The species is known from Madeira, Madagascar, Sey-

chelles Islands, Mauritius, Reunion, Palau Islands (Angaur), Fiji, the Philippines, China, Formosa, Java and (doubtfully) New Zealand.

CORRECTIONS—Dr. Hardy placed on record the following corrections to his paper "The Krauss Collection of Australian Fruit Flies" (Pacific Science, 5:115-189, 1951):

(a) The specific name *Dacus* (*Hemizeugodacus*) *algaiae* Hardy was a *lapsus calami*. It was based upon the plant genus *Aglaia*, and should be emended to *D. aglaiae*.

(b) The type locality designation under the discussion of *Dacus* (*Strumeta*) *laticaudus* Hardy is misleading. The type locality for this species is near Deeral, Queensland, ex *Planchonella* sp.; the type is in the U. S. National Museum. The type locality of *Strumeta fuscatus* Perkins and May is Cairns, Queensland, ex *Sideroxylon obovatum;* this type is in the University of Queensland collection.

AMOBIA sp.—In a discussion of this sarcophagid, associated with *Eumenes latreillei petiolaris* (Schulz), it was said that the eumenids are uncommon at the present time. Dr. Hardy, Mr. Rosa and Mr. Mitchell recently collected numbers of *Eumenes* cells and found empty *Amobia* (?) puparia in several of them; in two cases several dead flies were present, having apparently been unable to escape from the cells. In one case Dr. Pemberton called attention to puparia in a cell stored with spiders, suggesting that *Amobia* parasitizes *Sceliphron* as well as *Eumenes* larvae.

NOVEMBER 19, 1951

The 551st meeting was held at the H.S.P.A. Experiment Station on Monday, November 19, at 2:00 p.m., with President Hardy in the chair.

Members present: Adachi, Alicata, Balock, Bess, Bonnet, Bryan, Chong, Christenson, Clagg, Defibaugh, Dresner, Fullaway, Hardy, Hu, Keck, Look, Maehler, Mitchell, Newell, Nishida, Pemberton, Rosa, Sakimura, Martin Sherman, Steiner, Suehiro, Swezey, Tamashiro, Tuthill, Van Zwaluwenburg and Zimmerman.

Visitors: Alan P. Dodd, Edward Himeno, Harry Nakao and L. Schoening.

The name of Edward Himeno was proposed for membership in the Society.

PAPERS

The following papers were presented by title: "Two new Spider Egg Predators from the Hawaiian Islands (Diptera: Drosophilidae)" by Willis W. Wirth; "A Key to the Genera of Drosophilidae of the Pacific Islands (Diptera)" by Marshall R. Wheeler; and "Drapetis insularis, a new Species from Oahu (Diptera: Empididae)" by A. L. Melander.

NOTES AND EXHIBITIONS

PROTAETIA FUSCA (Herbst)—New Oahu locality records for this beetle were given by various members: Liliha St., Honolulu, by Miss Suehiro; within a house near the top of Tantalus, by Mr. Maehler; and Ewa Plantation Co., by Mr. Rosa.

ANAPHOTHRIPS CORBETTI Priesner—Mr. Fullaway reported that C. J. Davis on October 8, 1951, found this thrips on *Vanda* orchids in the Homestead district of Hilo, on Hawaii. The thrips were identified by Mr. Sakimura; it is the first record of this insect on the island of Hawaii.

Mr. Sakimura reported that from observations made in Honolulu, the host range of *A. corbetti* is not limited to the widely cultivated *Vanda Miss Joaquim*. Practically all *Vanda* hybrids are attacked, with *V. Miss Joaquim* and *V. Gilbert-Triboulet* often heavily infested. Other orchids infested by this thrips were several species or hybrids of *Dendrobium, Miltonia* and *Cattleya*. Infestation by this thrips was not seen on various species or hybrids of *Brassavola, Cypripedium, Spathoglottis* and *Arundina*. Apparently *A. corbetti* is limited to the orchid group, for some 22 flowers of other kinds commonly grown in Honolulu were found not to be infested.

A RECENT PARASITE INTRODUCTION—Mr. Fullaway said that among recent parasite material sent to Hawaii by Mr. Weber from Iowa and Kansas was the braconid, *Oncophanes americanus* (Weed), bred from the strawberry leaf-roller, *Ancylis* sp.

LAGOCHEIRUS OBSOLETUS Thomson—Dr. Swezey exhibited larvae, pupae and adults of this cerambycid, together with infested pieces of a *Brassaia* tree which illustrate the habit of the larva when preparing to pupate. Having fed to maturity in the decaying bark, the larva bores into the wood to make a pupal cell to which it retires after partially gnawing loose a circular disc of the outer bark, about an inch in diameter. After retiring to the pupal cell the larva manages to plug the opening with fibres and bits of wood before pupating. To emerge, the beetle has only to tear away this plug and break through the loosened disc of outer bark.

LAGOCHEIRUS FUNESTUS Thomson—Mr. Dodd called attention to a curious habit of this related beetle, introduced into Australia from Mexico, and from Australia to Hawaii, late in 1950 to feed on *Opuntia*. The female makes a series of roughly parallel grooves in the woody growth of the cactus, and at right angles to the first series, another set of parallel grooves. It deposits its eggs in these grooves and returns day after day to lay in the grooves prepared for the purpose.

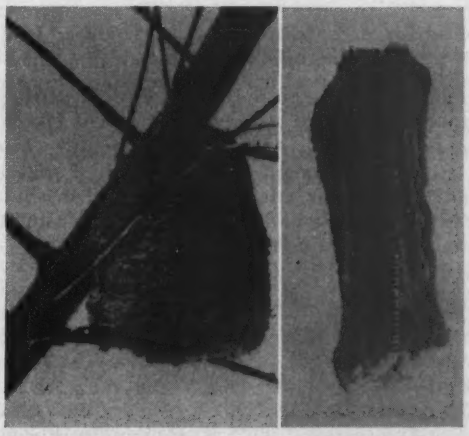
TOXORHYNCHITES BREVIPALPIS Theobald—Dr. Bonnet reported for Dr. Hu and himself that the first recovery outdoors of this giant cannibal mosquito in Hawaii occurred October 16, 1951, when two 3rd instar larvae were recovered from a tree-hole in upper Manoa Valley, Honolulu. This was a short distance from the site of an introduction on September 4, 1951. The recovery of these larvae in the field, as well as a later recovery in a bamboo stump on November 13, indicates that adults emerging from

the larvae placed in the field have survived long enough to mate and lay fertile eggs. A total of 602 larvae have been put out in various locations:

Date	Locality	Number of Larvae
August 28, 1951	Manoa Valley (Leong's)	100
September 4	Manoa Valley (Agee's)	100
September 11	Manoa Valley (Leong's)	100
September 18	Manoa Valley (Agee's)	100
September 20	Pupukea	100
October 3	Waiahole	102

A complicating factor in establishing this beneficial insect is the occurrence at this time of year of a prolonged 4th instar, and consequent delay in pupation. The same thing occurred at about the same time last year, with pupation in late March and early April. At present there are over 1,000 larvae in the colony being handled by Messrs. Bonnet and Hu, but no pupae and no adults.

TENODERA AUSTRALASIAE (Leach)—Dr. Pemberton exhibited specimens of this new mantid, and its egg-case. Surveys conducted during October indicate that the insect is numerous and widespread between the Ewa Plantation village where it was first found in mid-August of this year, and Iroquois Point. The species occurs in Australia, Tasmania, New Zealand, New Guinea, Ternate and Ceram.



Left: Egg-case of *Tenodera australasiae* (Leach).
Right: Egg-case of *T. angustipennis* Saussure.

A NEW TENEBRIONID BEETLE—Mr. Maehler exhibited two large tenebrionids taken in the aerial prop-roots of *Pandanus*, at Kuhio Wharf, Hilo, Hawaii on November 1, 1951. They appear to be identical with unnamed

specimens from New Guinea in the H.S.P.A. collection, and may be the same as specimens taken in wood at Pearl Harbor two years ago. The species is new to the Territory. [This was subsequently identified by Dr. E. A. Chapin as *Amarygmus* near, and possibly identical with, *morio* (F.), a species from Australia and New Guinea.]

ELYTROTEINUS SUBTRUNCATUS (Fairmaire) —Dr. Swezey exhibited larvae, pupae and adults of this so-called "ginger" weevil, bred from old avocado seeds lying under a tree in his Honolulu garden. This is a new food record for the species. The first record of its occurrence in Hawaii dates back to 1918, when it was found infesting root stocks of white ginger, *Hedychium coronarium,* in Nuuanu Valley, Honolulu. In 1933 it was found infesting roots of the day lily, *Hemerocallis.* Neither ginger nor day lily, both present, was found by Dr. Swezey to be infested in his garden. Dr. H. L. Lyon in 1950, found this weevil heavily infesting an old cycad trunk, in Foster Garden, Honolulu. Other known records for this insect are: ex lemons, Cook Islands, 1923; ex dead sugar cane, Tutuila, Samoa, 1923; ex *Marattia* fern trunk, Tahiti, 1950.

POLYTERUS SP.—Dr. Pemberton exhibited a single specimen of this ichneumonid, determined by Mr. Fullaway as *Sychnoportus* sp., caught in a light trap at Ewa, Oahu, September 10, 1951. It has not previously been taken in the Hawaiian Islands. The genus *Sychnoportus* is currently considered to be a synonym of *Polyterus.*

DECEMBER 10, 1951

The 552nd meeting was held at the H.S.P.A. Experiment Station on Monday, December 10, at 2:00 p.m., with President Hardy in the chair.

Members present: Adachi, Alicata, Bess, Bonnet, Carter, Chilson, Chong, Clagg, Clancy, Defibaugh, Dresner, Ford, Fullaway, Haramoto, Hardy, Kamasaki, Keck, Look, Messenger, Mitchell, Nishida, Pemberton, Rosa, Sakimura, Martin Sherman, Suehiro, Swezey, Tamashiro, Tuthill, Van Zwaluwenburg and Zimmerman.

Visitor: Alan P. Dodd.

Edward Himeno was unanimously elected to membership.

The annual election resulted in the following officers being chosen for 1952:

President	H. A. Bess
Vice-President	P. W. Weber
Secretary-Treasurer	R. H. Van Zwaluwenburg
Additional Members of Executive Committee	D. E. Hardy L. F. Steiner

President-elect Bess took the chair, and Dr. Hardy, the retiring President, read the annual Presidential address, entitled: "Additions and Corrections to Bryan's Check List of the Hawaiian Diptera."

PAPERS

Papers by the following authors were presented by title: P. E. Marucci and D. W. Clancy; Alan Stone and Leon Rosen; I. M. Newell, W. C. Mitchell and Francis Rathburn; J. F. Perkins; O. W. Richards; E. C. Zimmerman; K. E. Frick; R. L. Usinger; H. F. Box, and F. R. Shaw.

NOTES AND EXHIBITIONS

NEW RECORDS FROM KWAJALEIN—Mr. Keck reported finding the false black widow spider, *Latrodectus geometricus* Koch, and the night mosquito, *Culex quinquefasciatus* Say, on Kwajalein atoll on November 15, 1951. Identification of the mosquito was made by Dr. Stephen Hu.

LATRODECTUS GEOMETRICUS Koch—Dr. Hardy reported that a male, a female and a characteristic egg-case of this spider were recently sent him from French Frigate Shoal. They had been collected by a Mr. Jennings who reported that the island was infested with the spiders, and that a man there had recently been bitten. The victim became nauseated and the leg on which he had been bitten, was temporarily paralyzed. This is the first record of this spider from French Frigate. In a discussion which followed, doubt was expressed that the false black widow would ordinarily attack people, although the possibility of such an occurrence was conceded.

MELITTOBIA HAWAIIENSIS Perkins—Mr. Mitchell reported that a cell of *Sceliphron caementarium* (Drury) containing spiders as well as a *Sceliphron* larva, later produced a puparium of what was probably the sarcophagid, *Amobia* sp. About two weeks later some 100 parasites issued from the puparium and were identified by Dr. Pemberton as *Melittobia hawaiiensis*. This is the first record in Hawaii of *M. hawaiiensis* parasitizing a dipterous insect, although Clausen ("Entomophagous Insects": 143-146, 1940) records such a case, and states that other members of the genus are known to be hyperparasites on Tachinidae.

POLISTES EXCLAMANS EXCLAMANS Viereck—Mr. Clagg exhibited specimens of this vespid, recently discovered on Oahu. On October 17, 1951, colonies of the wasp were destroyed at a house at McGrew Point, Aiea, following complaints that children were being stung by the wasps. Specimens were identified as this species by Karl V. Krombein. This insect occurs in the United States from California to the Atlantic seaboard, as far north as Iowa and North Carolina, as well as in Mexico. The nest can be distinguished from those of other *Polistes* here in Hawaii by the petiole-like attachment being at the edge of the nest, rather than near the middle. Males appear to be more common than females. Three of the males collected at Aiea have the last five segments of both antennae modified into a hook; there is no increase in the number of antennal segments of these individuals.

COCCUS VIRIDIS (Green)—Mr. Fullaway reported finding this scale on panax (*Nothopanax guilfoylei*); this is believed to be a new hostplant record.

VANDUZEA SEGMENTATA (Fowler)—Mr. Fullaway reported that Stephen Au recently found this membracid on gorse at Olinda, Maui. This is a new island record. It was not certain that the insect was feeding or breeding on the gorse.

ANAGYRUS ANTONINAE Timberlake—Dr. Clancy reported that in 1949 several lots of the Rhodes grass scale, *Antonina graminis* (Maskell), parasitized by the encyrtid, *Anagyrus antoninae,* were collected in the Honolulu area and sent to southern Texas, where this scale has become a serious pest of various range grasses ("PROCEEDINGS," 14:7, 1950). Successful establishment of the parasite was recently reported by Paul T. Riherd (Journ. Econ. Ent., 44:622-623, 1951) at the Weslaco (Texas) Experiment Station. Liberations of *A. antoninae* are being continued on the King ranch where establishment of the parasite had earlier been prevented by a severe drought.

NOTES ON PARASITES OF FRUIT FLIES

The apparent establishment in Honolulu, of *Opius watersi* Fullaway, a parasite of *Dacus cucurbitae* Coquillett, was reported last year ("Proceedings," 14 [2]:232, 1951). Twenty-five females of this braconid were liberated near a *Momordica* vine on the University of Hawaii campus, August 12, 1950. Apparently conditions were favorable, for *watersi* adults were later recovered in each of the monthly collections of *Momordica* fruits from September through December. Moderate numbers of the parasite were recovered in September and October, but by November and December its numbers began to decrease, and the January collection yielded no *Opius*. Fifty per cent of the parasites in both the November and December collections were in diapause. Very few of the *Opius* which have gone through diapause in the laboratory have broken dormancy in less than three months. This fact increases the hazard of predatory action by ants and of other mortality factors to which the parasite is subject in nature. The record of *Opius watersi* in the field has dimmed the optimism with which this species was once regarded as an effective addition to the complex of enemies of the melon fly.

P. E. MARUCCI, March 12, 1951.

Of some 40 species of *Opius* found in over two years of entomological exploration, until now only two have been able to parasitize the melon fly. These are *Opius fletcheri* Silvestri, already established in Hawaii as the result of earlier work, and *O. watersi* Fullaway, from northern India. A third parasite of the melon fly is now in hand; this is an undescribed species designated as "North Borneo Opius No. 4"[1]. It was reared from tephritid puparia from *Luffa acutangula* collected in British North Borneo by Frank E. Skinner. It is a striking, large, black and red species of the *longicaudatus* type; it prefers large 3rd instar larvae for oviposition, but will oviposit in the smaller stages when forced to. It breeds readily in the laboratory on *Dacus cucurbitae,* and a large colony is established with sufficient adults already produced to begin field liberations. On May 2, 265 adults were sent to Hawaii for release on wild *Momordica balsamina,* and 760 were released at Waimanalo, Oahu on May 7 and May 14.

P. E. MARUCCI, May 14, 1951.

During late March and early April fruit fly-infested guavas collected on Hawaii, Maui and Molokai were sent to Honolulu where they were held in the University of Hawaii insectary. The records of parasitization of the *Dacus dorsalis* larvae recovered from these fruits are tabulated below:

[1] This species is described as *Opius angaleti* by D. T. Fullaway on p. 411 of this issue of the "Proceedings."

Island and Date of Collection	Number of Collections	Percentage Parasitization by Species			Total Parasitization
		O. vandenboschi	O. longicaudatus	O. oophilus	
Molokai March 28	3	7.3	0	31.6	38.9
Maui March 28 & 30...	12	25.0	1.1	37.8	63.9
Hawaii April 2-5	24	18.3	0.3	23.3	41.9

Note—No specimens of *Opius incisi* Silvestri were recovered from these collections.

The most important development revealed by these data is the rise to predominance of *Opius oophilus* Fullaway on each island. Records obtained in the fall of 1950 on these same islands showed *O. vandenboschi* Fullaway[2] to be the predominant parasite at that time. The rapid increase in importance of *O. oophilus* on these outer islands parallels the development which took place earlier on Oahu. Percentage parasitization in the Maui and Molokai collections was essentially the same for the spring collections as during the fall. However, the degree of parasitization on Hawaii was significantly lower in April than in October. This drop appears to have been correlated with a very sharp increase in guava infestation in the spring. It is felt that the lag in parasitization on Hawaii will be only temporary and that the percentage will increase again in the next several months.

ROBERT VAN DEN BOSCH, May 14, 1951.

Pupal parasitism of the oriental fruit fly occurred at two localities on Oahu during May. The first recovery consisted of eight *Spalangia* adults from host puparia in husks of ball kamani (*Calophyllum inophyllum*) fruits, collected at Kaaawa on May 31. Mr. Fullaway considers the species to be *Spalangia simplex* Perkins.

The second case of pupal parasitism was from puparia sifted from soil under a mock orange bush (*Murraya*) on the University of Hawaii campus. These puparia, collected May 22, produced 89 *Opius*, 4 *Dirhinus*, 3 *Spalangia* and 6 *Dacus dorsalis*. The *Dirhinus* was tentatively identified by Mr. Fullaway as *D. giffardii* Silvestri, while the *Spalangia* appears to be *simplex*.

Both species of pupal parasites have been established in Hawaii for many years. Their recovery from *D. dorsalis* is not surprising since *Spalangia* and *Dirhinus* are known to have a variety of hosts. Although they appear to be of minor importance in the biological control of *dorsalis*, they are welcome as additional mortality factors working against this pest.

ROBERT VAN DEN BOSCH, July 9, 1951.

During the past summer three recently introduced *Opius* parasites of *Dacus dorsalis* belonging to the *longicaudatus* group have been recovered

[2] This new name for *Opius javanus* Fullaway, preoccupied, is published on p. 413 of this issue of the "Proceedings." It is the species formerly designated locally as "presumably *O. persulcatus*."

in the Hawaiian Islands for the first time. On August 10, 1951, 2 males of *Opius formosanus* Fullaway were bred from mango from North Kohala, Hawaii. On August 12, 1 male and 1 female of *O. compensans* (Silvestri) were bred from kamani *(Terminalia)* from Waikane, Oahu. The following recoveries were made of a species as yet undescribed, known as "New Caledonia *Opius* No. 2":

July 31, 1951	Nuuanu, Oahu	ex *Achras sapote*	1 female; 4 males
August 24	No. Kohala, Hawaii	ex mango	2 females; 1 male
September 12	Waikane, Oahu	ex *Terminalia*	1 male
September 13	Kula, Maui	ex peach	8 females; 4 males

The peaches from Kula yielded adults of both the oriental fruit fly and the Mediterranean fruit fly; from all other host fruits only *D. dorsalis* was bred.

[Recoveries of all three of the above species continued through October and November, according to Q. C. Chock of the Board of Agriculture and Forestry. The color differences which separate the closely related *Opius* of the *longicaudatus* group are so slight, or so variable, that, among taxonomists best qualified to identify them, differences in opinion exist as to the validity of some of the species.—Ed.]

MABEL CHONG, December 10, 1951.

Probably the greatest disappointment after three years' intensive search for natural enemies of fruit flies in many parts of the world, has been the apparent failure to establish in Hawaii additional parasites of the melon fly, *Dacus cucurbitae.* Although many thousands of melon fly puparia were received from explorers in Malaya, India, Ceylon, Formosa, the Philippines, Borneo, Thailand, south China and Africa, only three species of larval parasites, other than the already established *Opius fletcheri,* were successfully bred on melon fly in Hawaii. These were *Opius watersi* from India, the cynipid, *Trybliographa daci* Weld from Malaya and Australia, and more recently *Opius angaleti* Fullaway[3] from North Borneo.

The subsequent mass production and liberation of *O. watersi* raised hopes that an effective melon fly parasite had been found at last. However, the only evidence of its possible establishment was obtained in the fall of 1950 when 46 adults were reared from infested *Momordica balsamina* fruits collected on the University of Hawaii campus following the liberation nearby of 25 adult females in August. These findings are recorded in notes presented before the Society in January and November, 1950 ("Proceedings," 14:229, 232, 1951) and on March 12, 1951. A final series of collections totalling 208 heavily infested *M. balsamina* fruits was made at the same location from January to October, 1951, but *O. watersi* had apparently failed to overwinter and was not recovered. We are unable to account for the lack of success with this promising melon fly parasite in Hawaii.

[3] Described on p. 411 of this issue of the "Proceedings."

The failure of *Trybliographa daci* was less surprising because this species is not normally a parasite of *D. cucurbitae,* and could be propagated on that host only with difficulty. Also liberations were directed primarily against *Dacus dorsalis* rather than the melon fly.

The introduction of *Opius angaleti* from North Borneo was noted by Mr. Marucci on May 14, 1951 (see above). Approximately 7,000 adults (851 females) of this parasite were propagated on melon fly larvae in the laboratory and turned over to the Territorial Board of Agriculture and Forestry for further increase and liberation. However, the ratio of female progeny declined rapidly and only 1,745 adults were liberated on Oahu and Hawaii in May, before breeding stocks were lost. It now appears that in North Borneo *O. angaleti* may actually have parasitized *Dacus nubilus* Hendel and *Callantra smieroides* Walker, since its presence was correlated with that of the former species in quarantine rearings, indicating probable forced breeding and imperfect adaptation to melon fly as a host.

Although one or more of these species may yet appear in Hawaii, the chances of their establishment here now seem remote.

D. W. CLANCY, December 10, 1951.

The parasitization of the Mediterranean fruit fly in the laboratory by the introduced parasites *(Opius* spp.*)* of the oriental fruit fly, and their apparent adaptation to this host in nature, has already been reported ("Proceedings," 14 [1]:27, 1950; 14 [2]:234, 1951). Additional evidence was obtained by P. E. Marucci of the U. S. Bureau of Entomology and Plant Quarantine, during the past summer that these opiines were attacking *Ceratitis capitata* (Wiedemann) on the island of Lanai where this species became the dominant fruit fly following large-scale insecticide applications.

Since puparia from mixed fruit fly infestations in the field cannot be definitely segregated as to species, we attempted to secure more accurate data on parasitization by making field exposures of laboratory-infested fruits containing pure cultures of *Dacus dorsalis* and *Ceratitis capitata.* These fruits were paired and suspended for several days at different locations in one-half inch mesh wire baskets, and then brought into the laboratory.

The oriental fruit fly oviposited to some extent in the fruit containing Mediterranean fruit fly infestations during its exposure in the field. The records from the fruits later found to contain infestations of both flies were not included in the tabulations of data. The Mediterranean fruit fly did not infest any of the fruits during their periods of field exposure.

Three series of field exposures totalling 24 paired, infested papayas and peaches were made during August in the Tripler Hospital area, and at Kapahulu, Manoa Valley, the University of Hawaii and Kalihi, all in Honolulu, with the following results:

Species	Exposure Dates	No. puparia reared	Ceratitis capitata	Dacus dorsalis	Opius longicaudatus	Opius incisi	Opius oophilus	Opius "persulcatus"[4]	Parasitized	
									Total	Per Cent
Ceratitis	Aug. 2-6*	179	46	...	9	0	8	2	19	29.2
capitata	Aug. 6-9†	396	88	...	40	8	0	0	48	35.3
	Aug. 9-15*	702	283	...	18	22	4	3	47	14.2
Totals		1,277	417		67	30	12	5	114	21.5
Dacus	Aug. 2-6*	2,134	...	1,255	77	66	25	11	179	12.5
dorsalis	Aug. 6-9†	2,106	...	1,599	271	54	14	0	339	17.5
	Aug. 9-15*	1,021	...	414	207	98	5	2	312	43.0
Totals		5,261		3,268	555	218	44	13	830	20.3

* In ripe papayas.
† In ripe peaches.

Although Mediterranean fruit fly populations in these tests were considerably lower than those of *D. dorsalis,* both species were parasitized to about the same extent under identical field conditions. *O. longicaudatus* (Ashmead) and *O. incisi* Silvestri were reared in the same relative abundance from each fruit fly host, indicating an apparent lack of selection or specificity for these two parasites under the conditions of the experiment. The percentages of parasitization of *Ceratitis* by *O. oophilus* and *O. "persulcatus"*[4] were considerably higher than for *D. dorsalis,* but these differences are of doubtful significance because of the small numbers of parasites involved in the *Ceratitis* study. This is the first record of *O. incisi* from the Mediterranean fruit fly, and its abundance, particularly on the University campus and at Kalihi, was surprising.

These studies clearly indicate the potential importance of the introduced Malayan opiines as parasites of *Ceratitis capitata,* and also suggest their possible utilization against still other species of fruit flies elsewhere in the world.

D. W. CLANCY, December 10, 1951.

[4] This is the species to which Fullaway has given the name *Opius vandenboschi,* on p. 413 of this issue of the "Proceedings."

Insect Fauna of a Coconut Tree

By O. H. SWEZEY

EXPERIMENT STATION, H.S.P.A., HONOLULU

The records of insects given here are based on observations of insects associated with an 8-year-old coconut tree standing at the back of my lot at 2044 Lanihuli Drive in Manoa Valley, Honolulu.

Apis mellifera L. The common honey bee was very abundant collecting nectar and pollen from the flowers every time that there was a new inflorescence.

Omiodes blackburni (Butler). The notorious coconut leafroller. A native moth which was first observed, or recorded, by Dr. Wm. Hillebrand, at Lahaina, Maui, in the 1860s. In the "Flora of the Hawaiian Islands," which was the result of his botanical observations during his residence in Honolulu, 1851-1871, in discussing the coconut and how vigorously it thrives at this latitude, he says: ". . . For a number of years, however, its leaves have been subject to the attacks of a moth which deposits its eggs in the folds of the leaf-segments. Before the caterpillars have entered the pupa stage, the young leaves are literally reduced to shreds, which gives to the trees a sad appearance and creates in the occasional visitor the impression that they live under unsuitable climatic conditions." One could infer from this that here was an introduced immigrant pest from some unknown region where it was a pest on the coconut. However, in the literature on coconut insect pests, to which much attention has been given, this particular moth is not mentioned as occurring outside of the Hawaiian Islands. From the fact that this moth is often found infesting the native *Pritchardia* palms when planted at low elevations, it is presumed that these trees could have been the original host-plant where they occurred in the mountain forests.

My coconut tree has had only slight infestation by this moth. Some of its parasites: *Zaleptopygus flavo-orbitalis* (Cameron) on the caterpillars, and *Brachymeria obscurata* (Walker) on the pupae. There are a number of other parasites which are usually present and keep the pest well checked in most localities in the Hawaiian Islands, but they were not present on my tree.

Agonoxena argaula Meyrick, is a recent immigrant moth from Samoa or Fiji, where it occurs on leaves of coconut and other palm trees. It was first observed on coconut leaves in Honolulu in 1948. It is a small moth, and its caterpillars feed on the underside of the leaflets under a slight web, and produce numerous narrow dead spots where they have eaten off the parenchyma, leaving the upper epidermis. The leaves of my tree are decorated with thousands of these dead spots, but the tree seems to be thrifty. A parasite: *Brachymeria agonoxenae* Fullaway was introduced

from Samoa in 1948. I have reared it commonly from the pupae of this moth.

Decadarchis minuscula (Walsingham), is a native moth which I have reared from caterpillars found among the mess of a mealybug infestation.

Rhabdoscelus obscurus (Boisduval), the sugar cane borer, has sometimes been found in the base of the petioles. A tachinid parasite: *Microceromasia sphenophori* (Villeneuve) destroys some of the borer grubs.

Diocalandra taitensis (Guerin), is another weevil whose larvae are abundant in the petioles of the leaves, especially towards the base.

Scholastes bimaculatus Hendel. I have observed this otitid fly about, but there have not been any coconuts for it to infest; they are accustomed to breed in old decaying or rat-eaten nuts on the ground.

Pheidole megacephala (F.). Very populous colonies of this ant are located among the accumulation of decaying fibrous material at bases of the leaves.

A number of scales are abundant, as follows:

Phenacaspis sandwicensis (Fullaway), is a white scale which occurs on the leaves, especially where leaflets are closely folded together. The following parasites were reared: *Arrhenophagus albipes* Girault; *Aspidiotiphagus citrinus* (Craw); and the predaceous ladybird beetle *Lindorus lophanthae* (Blaisdell).

Diaspis boisduvalii Signoret, is a white scale occurring in quite considerable patches on the trunk and base of petioles. The parasite: *Plagiomerus diaspidis* Crawford was reared; and the little black ladybird beetle: *Telsimia nitida* Chapin was feeding on the scales.

Chrysomphalus ficus Ashmead, is a circular reddish scale occurring on the leaves. There were two parasites on it: *Aphytis chrysomphali* (Mercet) and *Aspidiotiphagus citrinus* (Craw). The ladybird beetle: *Curinus coeruleus* (Mulsant) was also present.

Pseudococcus palmarum (Ehrhorn), is a mealybug occurring on the leaves, especially where the folds of leaflets are in close contact.

Pinnaspis buxi (Bouché), is a very small scale that has been destructive to the coconut trees at times in Hilo, Hawaii, and at Hanalei, Kauai. *Telsimia nitida* Chapin was introduced from Guam in 1936 and checked these infestations. I have not seen *P. buxi* on my tree, but the little ladybird beetle was found feeding on *Diaspis* scales there.

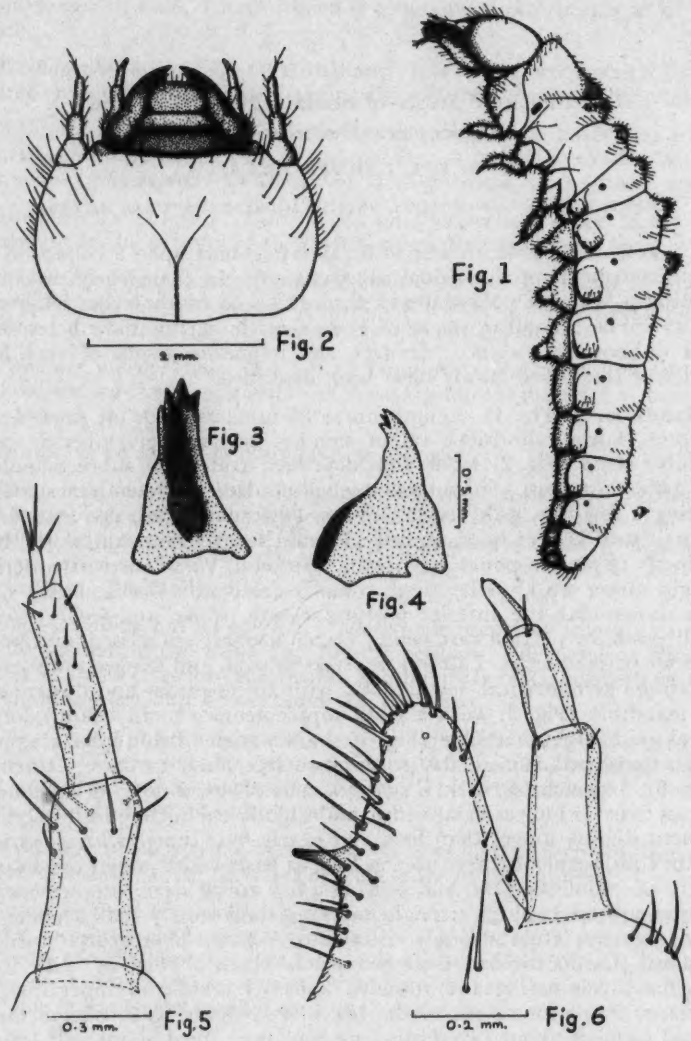
The Immature Stages of Sessinia livida (Fabricius) (Coleoptera: Oedemeridae)

By E. A. J. DUFFY, F.R.E.S.

DEPARTMENT OF ENTOMOLOGY, BRITISH MUSEUM (NATURAL HISTORY)

It is of considerable interest to be able to report upon a collection of larvae and pupae of the oedemerid *Sessinia livida* (Fabricius) procured by Bishop Museum's Mangarevan Expedition to southeastern Polynesia in 1934. The immature stages of beetles of this genus have heretofore been unknown to science. In fact, the immature stages of very few species of the entire family have been described.

Mature larva (Fig. 1). Length up to 25 mm.; breadth (at prothorax) 3.9 mm. Form cylindrical, rather slender, and strongly tapering posteriorly. *Head* (Fig. 2) moderately depressed, transverse, subrectangular, and pale testaceous. Sides moderately rounded, with temples smooth, bearing a few fine, pale setae. Median adfrontal suture not extending beyond basal half of head capsule. Frontal sutures faint anteriorly, but distinctly impressed posteriorly in the form of a 'V'. Frons with anterior margin rather weakly sclerotised, roundly declivous. Ocelli absent. Clypeus trapezoidal, the anterior portion smooth, white, and feebly sclerotised; posterior portion castaneous, rather strongly sclerotised, and bearing four pairs of setae. Labrum transversely oval, and fringed with setae. Mandibles asymmetrical, ferruginous, with apices pitchy and tri-dentate; left mandible (Fig. 3) with a small supplementary tooth behind dorsal apical tooth; right mandible (Fig. 4) slightly angled behind dorsal apical tooth; mola well-defined, the grinding surface finely carinate. Antenna (Fig. 5) 3-segmented, with a very large basal membrane; first segment at least twice as long as basal width, and slightly enlarged apically; second segment slightly longer than first, and nearly four times as long as basal width; third segment three times as long as basal width, about one-fourth length of second segment, and bearing a few apical setae; supplementary hyaline process conical, strongly tapering, and nearly half as long as third segment. Gula strongly transverse. Ventral mouthparts strongly retracted. Cardo divided into two parts. Maxilla (Fig. 6) with lobe wide basally, tapering and rounded apically; middle of inner margin produced into a long stout tooth. Maxillary palpi (Fig. 6) 3-segmented; second segment about two-thirds length of first; third about half length of second. Labial palpi (Fig. 7) 2-segmented; first segment bearing a pair of setae on inner margin near apex; second segment about half length of first. Hypopharyngeal sclerite (Fig. 7) very strongly sclerotised, with anterior margin obliquely truncate; projecting beyond this sclerite is a densely setose tongue-like lobe. *Prothorax* scarcely depressed, transverse, with posterior margin 'V'-shaped. Pronotum with median cleavage line



Anatomy of *Sessinia livida* L.

Figure 1. Mature larva (lateral view).
Figure 2. Mature larva; head (dorsal view).
Figure 3. Mature larva; left mandible.
Figure 4. Mature larva; right mandible.
Figure 5. Mature larva; left antenna.
Figure 6. Mature larva; apical part of left maxilla.

deep posteriorly, and bisecting a median lobe which bears a pair of subtriangular asperate areas. Eusternum separated from presternum by a median 'V'-shaped suture. *Mesonotum* and *metanotum* with paired, transversely-oval, raised, tuberculate, asperate areas. *Abdomen* with tergites 1-3 with similar asperate areas which are more strongly protuberant. Tergites 4-9 strongly elongate, without asperities, and very sparsely setose. Ninth tergite without urogomphi. Sternites 2-4 very strongly bilobed, the lobes resembling, if not in fact, prolegs; each lobe strongly produced, teat-shaped, and bearing numerous coarse asperities and very fine setae. Sternites 5-9 without asperities, and sparsely setose. Tenth segment small, ventrally placed, rounded, strongly protuberant (used as pseudopod?); anus a transverse cleft. Epipleura distinct, and protuberant on segments 1-9. Hypopleura indistinct. *Legs* (Fig. 8) well-developed, 4-segmented; femur and tibiotarsus about equal in length, and bearing numerous coarse, pale setae on inner face; unguiculus stout, apical half ferruginous, and with a stout sub-basal seta. *Spiracles* of mesothorax large, with peritreme thick, testaceous, and rather narrowly oval; abdominal spiracles small, with peritreme thin, round, and with inner margins lined with subcontiguous chambers as figured (Fig. 9).

Pupa (Fig. 10). General form as in adult; elongate, slender. Length up to 16 mm.; maximum breadth (at prothorax) 3.2 mm. *Head* depressed, not visible from above. Disc smooth. Front with groups of long setose papillae near upper margin of each eye, and near base of each antenna. Antennae slender, sparsely spiculate, extending ventrally on top of elytra to about as far as the apices. Labrum deeply bilobed apically, and bearing a few fine setae. Mandibles each with 2-6 fine setae on outer face. Maxillary palpi elongate, more than twice as long as mandibles. *Pronotum* smooth, bearing scattered, pale, setose papillae as figured. *Mesonotum* and *metanotum* each with a pair of paramedian papillate areas, the papillae much shorter than those on pronotum. Scutellum glabrous. Elytra and wings extending almost as far as fourth abdominal segment. *Abdomen* with tergites 1-8 each with a transverse row of minute spines (each with a very long apical seta) near posterior margin, and a few scattered similar spines anterior to these. Lateral margins of tergites bearing 2-3 setose papillae similar to those on pronotum. Ninth tergum with a pair of vertical slender, slightly curved, ferruginous urogomphi, which are separated by almost the width of the segment. Sternites each with 2-3 pairs of sublateral, setose spinules. Ninth sternite bilobed, each lobe bearing 2-3 asperities. Tenth segment retracted into ninth. *Legs* with femora bearing a few setose papillae at apex; tibiae each with conspicuous apical spurs; tarsi with claws bearing 1-2 pairs of minute setae; hind-tarsi extending as far as sixth abdominal segment. *Functional spiracles* present on segments 1-7; peritreme round, thick, and pale testaceous.

Material studied. 5 larvae, 4 pupae, 2 imagines. Society Islands: Meetia Island, Fatia-po; 500-900 ft.; 12.v.1934; from rotten log of *Hibiscus tiliaceus;* collected by E. C. Zimmerman. Specimens will be deposited in the

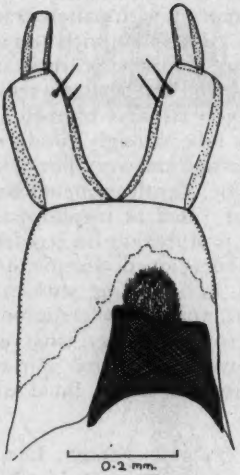


Fig. 7

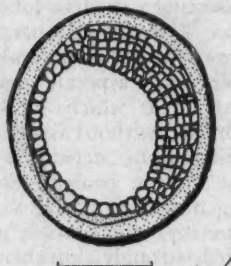


Fig. 9

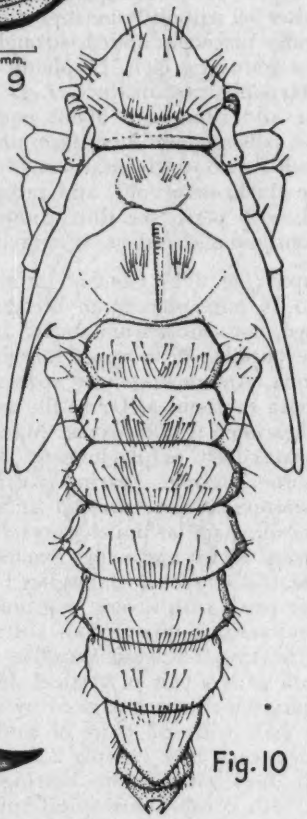


Fig. 10

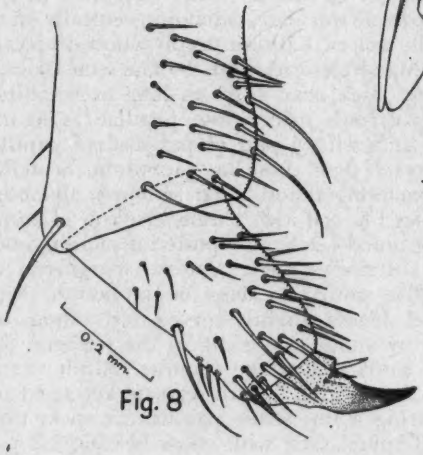


Fig. 8

Anatomy of *Sessinia livida* L.

Figure 7. Mature larva; showing position of hypopharyngeal sclerite in relation to labial palp.
Figure 8. Mature larva; apical part of right prothoracic leg.
Figure 9. Mature larva; peritreme of abdominal spiracle.
Figure 10. Pupa (dorsal view).

collections of Bishop Museum, British Museum (Natural History), and the United States National Museum.

The larva of this species closely resembles that of *Falsosessinia sculpticollis* (Fairmaire), described by Gardner (1929). The main characters these species possess in common are: (1) the presence of asperities on abdominal tergites 1-3, and of prolegs on sternites 2-4; (2) the presence of a long stout tooth on the inner margin of the maxillary lobe; and (3) the absence of ocelli. The larva of *S. livida* may be distinguished from that of *F. sculpticollis* by the absence of a median tubercle on the posterior part of the clypeus, and by the asperities of the first abdominal tergite, which are not distinctly smaller than those on tergites 2-3.

Both these species are wide-spread and oceanic, their known distribution being as follows:

S. livida: Marquesas Islands, Fiji, and Tonga; Samoa, Ellice Islands, Funafuti, Henderson, and Society Islands (Blair, 1935).

F. sculpticollis: Sumatra; Andaman Islands (Gardner, 1929).

Another oedemerid likely to become established in the Society Islands is the well-known *Nacerdes melanura* (L.), which in recent years has become almost cosmopolitan. Larvae of *Nacerdes* may at once be distinguished from those of *Sessinia* and *Falsosessinia* by the presence of only two pairs of ventral prolegs.

The immature stages of most oedemerids are passed in old wood, some species preferring that which is rather damp and punky, others that which is quite dry. Their wide distribution may almost certainly be attributed to the fact that these larvae are highly resistant to salt water, and are carried to various parts of the world in wooden structures, ships, and in drift wood. *Sessinia livida* may prove to be destructive to wharves, hulks, and even structural timbers of buildings, in the same way as has *Nacerdes melanura*.

In conclusion, I wish to thank Elwood C. Zimmerman of the Experiment Station, Hawaiian Sugar Planters' Association, and Bernice P. Bishop Museum, Honolulu, for suggesting the preparation of this paper, and for his kindness in lending me the material studied.

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Additions to the Thysanoptera of New Caledonia

By FRED A. BIANCHI

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In the "Introduction to the Thysanoptera of New Caledonia" (Proceedings 12, 2:249, 1945) I recorded 22 species. I now add five species to the original list, all given me by Noel L. H. Krauss, of the Board of Agriculture and Forestry of Hawaii, who collected in New Caledonia from May to July 1950. Three of these are here described as new; one is already known in the Pacific; the fifth is probably a species from Malaya. All the type material is deposited in the collection of the Experiment Station, H.S.P.A.

Dichaetothrips setidens (Moulton)

1928 *Mesothrips setidens* Moulton. Proc. Haw. Ent. Soc. 7, 1:129

1935 *Cryptothrips niger* Moulton and Steinweden. B. P. Bishop Mus. Bull. 114:165

1939 *Dichaetothrips niger* (Moulton and Steinweden). Moulton, Occ. Papers B. P. Bishop Mus. 17, 22:308

Described originally from Hawaii; known also from Fiji, the Gambier and the Mangarevan Islands. One female collected by Krauss at Noumea in August 1950.

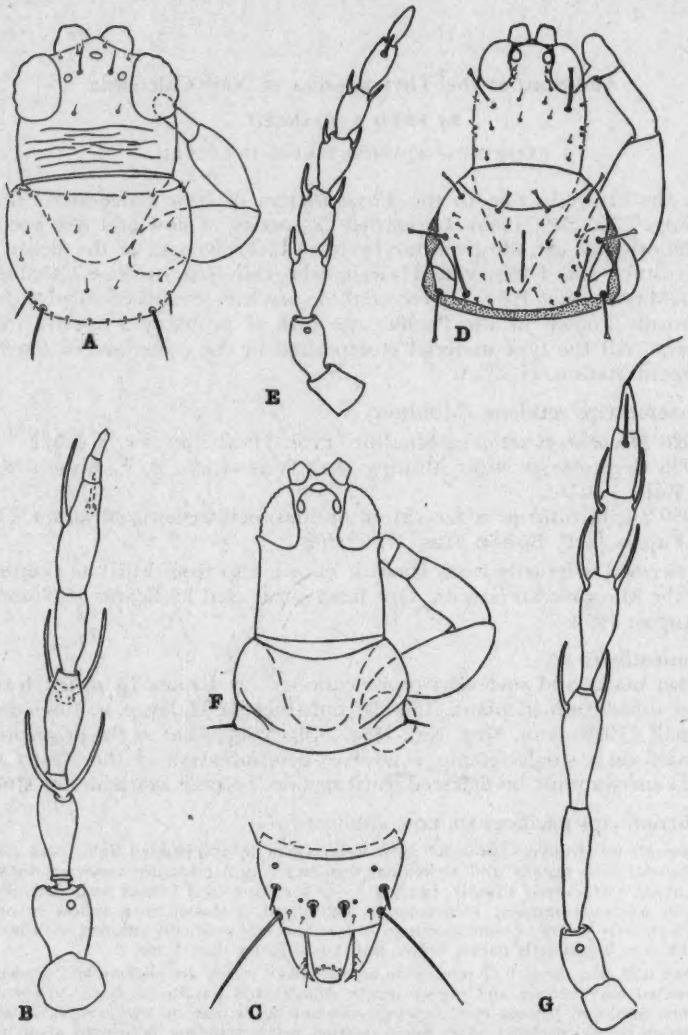
Adraneothrips sp.

Two males and several nymphs collected by Krauss in rolled leaves of an undetermined plant. This is probably the Malayan *A. fuscicornis* Bagnall (1929—Ann. Mag. Nat. Hist. (10) 3:606), but as the description is based on a single female, a positive determination of the New Caledonia species must be deferred until females become available for study.

Arrhenothrips pacificus sp. nov. (figures F, G)

Macropterous female.—About 2.6 mm. long. Color by transmitted light, dark chestnut brown; tube distally and abdominal segments 2 to 6 medianly somewhat lighter; fore tibiae, particularly distally, tending to yellow; fore tarsi yellow with dark distal macula. Antennal segment 1 concolorous with head, 2 shaded with yellow in outer half, 3 entirely yellow, 4 concolorous with 3 at base but gradually suffused with brown distally, 5 to 8 gradually darker brown but much lighter than 1 and 2.

Head 0.23 mm. long, 0.22 mm. wide across cheeks which are slightly and gradually constricted back of eyes and thence nearly straight and parallel to base. Vertex full but not produced beyond eyes, bearing posterior ocelli close to eye margin, anterior ocellus on frontal declivity. Eyes finely facetted, not protruding, occupying about two-fifths of head length and, together, about three-fifths of head width, their inner angles widely rounded, their inner edges emarginate around posterior ocelli. Dorsum with many fine anastomosing striae, with scattered thorn-like microsetae particularly prominent on the cheeks. Postocular setae clear, expanded at end, about four-fifths as long as eye, set less than half its own length from hind margin of eye and about same distance from cheek. Mouth cone acute, nearly attaining hind margin of prosternum. Antennae as illustrated.



A. Oxythrips festivus sp. nov. Head and prothorax of female. **B. O. festivus** sp. nov. Right antenna of female, dorsal view. **C. O. festivus** sp. nov. Ninth and tenth abdominal segments of male, dorsal view. **D. Leeuwenia angulata** sp. nov. Head and prothorax of female. **E. L. angulata** sp. nov. Right antenna of female, dorsal view. **F. Arrhenothrips pacificus** sp. nov. Head and prothorax of female, dorsal view. **G. A. pacificus** sp. nov. Right antenna of female, dorsal view.

Prothorax without coxae 0.16 mm. wide, 0.09 mm. long; median suture thick, but not attaining either front or hind margin; disk with weak reticular and sub-reticular striation and about 12 pairs of microsetae. Normal bristles present, clear or nearly so and expanded at end; epimerals and postero-angulars about equal, longer than laterals and antero-angulars which are also about equal; antero-marginals shortest; coxals about as long as laterals. Legs normal to the genus; fore femora greatly incrassate; fore tibiae with broad tubercle-like distal production of the inner angle; basal segment of fore tarsi with a stout spur and on the outside with a small claw.

Pterothorax about as prothorax in front, with the sides weakly arcuate and convergent posteriorly. Metascutum distinctly reticulate, bearing a pair of small bristles widely separated near the mid-transverse line and a compact group of three microsetae at each front angle. Wings lightly and evenly yellowish brown, with 15-17 duplicated ciliae; the first two sub-basal setae about equal and expanded at end; the third shorter and pointed.

Abdomen evenly wide to segment 7; segment 8 suddenly narrowing to 9. Segments 2-7 with well developed sigmoid and postero-angular setae and bearing a pair of small pori on the mid-transverse line close to the meson. Bristles on segment 9 about three-fifths as long as tube; terminals about four-fifths. Tube nearly twice as wide at base as at end; the sides more strongly convergent in distal 7th or 8th.

Measurements of female in millimeters: Head length 0.255; head width 0.246; eye length 0.096; eye width 0.070; prothorax length 0.193; prothorax width (somewhat expanded) 0.369; pterothorax width in front 0.440; width of fore femora 0.140; tube length 0.220; tube width at base 0.088; tube width at end 0.044; setae: postocular 0.079; epimeral 0.105; postangular 0.096; midlateral 0.070; antero-angular 0.061; antero-marginal 0.035.

Antennal segments:	1	2	3	4	5	6	7	8	Total
Length	.041	.053	.061	.057	.053	.053	.053	.041	.415
Width	.036	.036	.036	.036	.036	.032	.024	.016	

Macropterous male.—Generally smaller than female (about 2.5 mm. long) but in color and shape similar to it, except for sexual differences of the ninth segment and tube. The eighth ventrite bears a narrow glandular area nearly across the whole width of the segment.

Measurements: Head length 0.228; head width 0.202; prothorax length 0.193; prothorax width 0.308; pterothorax in front 0.413; tube length 0.193; tube width at base 0.061, at end 0.044.

Antennal segments:	1	2	3	4	5	6	7	8	Total
Length	.041	.049	.061	.057	.057	.049	.049	.041	.398
Width	.....	.032	.036	.036	.032	.028	.024	.016	

Described from the female holotype, the male allotype, and two male and two female paratypes; collected by N. L. H. Krauss in Bois du Sud, New Caledonia, in July 1950. These, and a series which is preserved in alcohol, were found in "rolled leaves of an undetermined plant."

A. pacificus is the third species of the genus to be described. The other two *A. ramakrishnae* Hood (Insec. Insc. Mens., 1919, 7:99) and *A. dhumrapaksha* Ayyar (Mem. Dept. Agric. India, 1928, 10,7:28) are both Indian. The three seem to be closely related, but they can be separated by the following differences, according to description: *A. pacificus* has the margin of the eyes emarginate around the ocelli. In *dhumrapaksha* the postoculars are longer than the eye; in *pacificus* and *ramakrishnae*, shorter. In *pacificus* the antero-marginal and midlateral bristles of the prothorax are long and dilated at the tip; in *ramakrishnae* they are short and pointed, and in *dhumrapaksha* not mentioned. In *dhumrapaksha* the sides of the eighth ventral segment project in the middle; not so in

either *ramakrishnae* or *pacificus*. In *dhumrapaksha* and *ramakrishnae* all three basal bristles of the fore wings are expanded; in *pacificus* the distal bristle is shorter than the others and pointed. In *dhumrapaksha* the front wings bear ten duplicate ciliae; in *pacificus* and *ramakrishnae* the number is fifteen or more.

Leeuwenia angulata sp. nov. (figures D, E)

Macropterous female.—Color by transmitted light, brown; the tube, ninth abdominal segment, and fore part of mesothorax darkest; abdominal segments 1 to 7 palest, yellow laterally, as are the fore angles of 8; segments 2, 3, 4, particularly 3, nearly translucent medianly. Ocellar crescents and subhypodermal pigment red; the pigment scattered laterally on the pterothorax and the first four abdominal segments. Striation rugose and reticular, more distinctly so between and behind the eyes, on the prothorax, on the metascutum and metapleura, on the front half of the abdominal tergites, on the base of the tube, and on the legs. Most of the body, particularly the legs and tube, densely beset with microtrichia. Wings pale brownish yellow; fore wing with an irregular brown area on the second quarter; hind wing with a narrow brown band along the middle from base to near the end.

Antennae shaped as illustrated. Segments 1, 7, 8 entirely brown; 2 fading to yellow distally; 3 entirely pale yellow; 4 and 5 somewhat darker yellow, with 5 barely suffused with brown distally; 6 yellow at base, gradually turning to brown on distal half.

Head 0.34 mm. long on the midline and 0.28 mm. wide at base, 0.25 mm. wide across the eyes; without developed setae. Cheeks straight and converging to near the eyes, then curving weakly outward at the hind angle of the eye, and inward again at almost a right angle. Vertex produced into a rounded prominence which bears the three ocelli, the front one directed forward and slightly surpassing the insertion of the antennae and the front margin of the eyes, but not the interantennal costa. Eyes with about 12 facets on the outer margin; the inner hind angle rounded and somewhat produced caudally. Mouth cone broadly rounded at end and almost attaining margin of prosternum.

Prothorax 1.4 as wide as head and somewhat more than half as long, with front margin weakly concave, the front angles rounded, and the sides weakly diverging posteriorly. Pronotum reticulate and bearing many microsetae; disk broadly depressed medianly and raised caudo-laterally to a well-marked carina which curves in from either side; each posterior angle produced dorso-caudally into a prominence which bears a pale, stiff seta at its summit and is separated from the disk by the sharply excavate epimeral suture. Pterothorax much wider than prothorax, 0.49 mm. wide in front. Sides of metathorax swollen. Legs rugosely reticulate, with one or two short stiff bristles distally on the tibiae and with many microsetae all over, otherwise unarmed; tarsi without claws.

Abdomen of nearly equal width to segment 8; segment 9 suddenly narrower and cone shaped; segments 2 to 7 with well developed pair of sigmoid setae on each side; 2 to 8 with a stout seta (about 0.079 mm. long) on each posterior angle; 9 with two such setae. Tube about four times as long as head, suddenly expanded near the base and suddenly constricted near the end, otherwise of nearly even width; with many rather appressed, short (0.035 mm. long) setae which disappear near the base and near the end of the tube; with a distal rosette of setae about 0.21 mm. long.

Measurements in mm.: Total length 3.83, fully extended; median length of head 0.308; cheek length 0.193; eye length 0.123; head width at base 0.281; head width across eyes 0.237; prothorax length 0.167; prothorax width 0.404; width of mesothorax on front angles 0.492; tube length 1.26; tube width at extreme base 0.088.

Antennal segments:	1	2	3	4	5	6	7	8	Total
Length	.041	.061	.122	.102	.102	.073	.061	.045	.607
Width	.041	.036	.028	.036	.036	.032	.028	.016	

Described from a single female collected by N. L. H. Krauss in Saint Louis, New Caledonia, in June 1950. The male is unknown.

To judge from the produced vertex of this species its nearest relative should be *L. caelatrix* Karny (Treubia 3:368, 1923). The two species cannot be confused, however, as they differ in antennal color, in the presence of antero-angular setae on the prothorax of *caelatrix*, and in the peculiar post-ocular development of the cheeks in *angulata*. To judge from descriptions alone, this character should differentiate *angulata* from all the other known members of the genus, as well. It has suggested the name *angulata*.

Oxythrips festivus sp. nov. (figures A, B and C)

Macropterous female.—Color by transmitted light, chestnut brown, except tarsi and tibiae which are pale yellow; the middle and hind tibiae lightly brown at extreme base and all tarsi with brown macula on distal segment. Ocellar crescents and sub-hypodermal pigment red. Antennal segment 1 concolorous with body; 2 concolorous basally but lighter distally; 3, 4, 5 concolorous with tibiae; 6, 7, 8 light brown except basal 3d of 6 which is concolorous with 5. Fore wing light brown, nearly clear on basal fourth; veins, beyond basal area of wing, indicated only by series of short brown setae; fore vein with 6-1-1-1; hind vein with 9 equally spaced in the middle; costa with about 20. Hind wing paler than fore wing, with darker mid-vein fading near base and apex.

Head wider than long, striated with confluent lines on basal half; eyes slightly protruding; cheeks nearly straight; ocelli widely separated, with interocellar setae nearer to hind ocelli and just within sides of triangle; front somewhat angular, with two minute setae on either side, one next to the eye and the other near midline; a series of four or five minute setae caudad of the base of each eye and a somewhat stronger one caudad of each ocellus. Mouth cone rounded at end and attaining middle of pronotum.

Prothorax angular in front, broadly rounded in back; disk with four to six pairs of microsetae; anterior margin with three on each side and a somewhat stouter one on each front angle; posterior margin on each side with a small seta (.004 mm.) outwardly, followed by a microseta, then a large seta (.016 mm.) followed by a series of three microsetae. Metascutum finely punctate medianly and with only a few confluent striae laterally and caudally; two inner setae distant about their own length from the front margin, and two outer setae nearly on the margin; two pores caudad of the inner setae, placed as far from the midline as the setae and a little farther back from the bases of the setae than these are from the front margin of the metascutum. Legs normal; fore femora shorter and stouter than others; tarsi unarmed.

Abdominal tergite 1 with pori on transverse midline; tergites 2 to 7 with short, irregular, comb-line extension of hind margin near the posterior angle of each tergite; tergite 8 with more regular and longer comb on entire margin; segment 10 conical and split dorsally nearly to its base. Bristles on 9 dark, much longer and stouter than those on 10.

Measurements of female in mm.: Total length 1.2, fully extended; head length 0.135; head with 0.168; eye length 0.069; eye width 0.049; inter-ocellar setae 0.024; prothorax length 0.135; prothorax width 0.184; outer seta on hind angle 0.016; inner seta on hind angle 0.041; longest seta on 9th abdominal segment 0.135.

Antennal segments:	1	2	3	4	5	6	7	8	Total
Length	.020	.036	.053	.053	.036	.053	.012	.016	.273
Width	.032	.028	.020	.016	.016	.018	.008	.004	

Brachypterous male.—In color and shape like the female but smaller, 0.86 mm. long; forked trichomes on antennal segments 3 and 4 shorter; comb on abdominal segment 8 lacking and on other segments either lacking or nearly so. Wings wide for their length but reaching only to the 3d abdominal segment and with only 4 or 5 setae on the anterior vein. Abdominal tergite 9 bearing a relatively large porus near each anterior angle, a thick sharp seta (0.024 mm. long) caudo-laterad of the porus, a thicker, shorter (0.012 mm. long), blunt seta near the midline of the segment, a pore laterad of this seta, and a long, stout bristle at each hind angle. Segment 10 short and cone-like. Ventrites 3 to 7 with oval sense areas about 0.053 mm. long, and 0.020 mm. wide.

Described from the female holotype, the male allotype, and three female and two male paratypes, all collected by N. L. H. Krauss in Bois du Sud, New Caledonia, in July 1950.

While undoubtedly a true *Oxythrips*, this new species can be distinguished from all others of the genus by the peculiar combination of its less unique characters and, more particularly, by the comb-like development on the posterior angles of abdominal segments 2 to 7.

A Comparative Study of Spermatozoa in Relation to the Classification of Mealybugs

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To offer proof of its validity, a system of insect classification must remain in agreement with the majority of facts uncovered during the continuous process of entomological research. Unless such a system is founded on a large area of empirical truth it will soon yield to a new and better concept. As a result of being subjected to a constant critical analysis there seems to be evolving slowly a genuine system of insect classification which should not prove as transitory as its predecessors. Such relative stability is being achieved only by using as the basis of classification a correlation of the best information available from all sources, morphological, physiological and ecological.

One purpose of this paper is to cite an example of how perhaps seemingly irrelevant material may at times contribute to the science of systematics. For although this paper had its origin in an anatomical study of insect spermatozoa, its findings are now employed to add supporting evidence to a recent revision of the genus *Pseudococcus* based on entirely different characters.

The technique for examining spermatozoa of mealybugs is remarkably rapid and relatively simple. The testes are dissected from a male mealybug and placed in a small droplet of distilled water on a clean glass slide. The testes are then ruptured with a needle to free the spermatozoa into the water droplet. In order to keep the slides as free of extraneous material as possible, it has been found advisable to make a transfer of about half the spermatozoa to another water droplet by means of a micropipette improvised from a finely drawn-out piece of glass tubing. This method of transferring mealybug spermatozoa has also been successfully employed in the preparation of grid mounts for electron microscopy. The water droplet containing the spermatozoa is allowed to dry, and it is a fortunate and remarkable fact that the spermatozoa will withstand not only dessication but also the vacuum of an electron microscope without any apparent alteration of form. If the spermatozoa are to be examined with a conventional compound light microscope they are stained, after drying, with giemsa blood stain and then rinsed in distilled water. Other stains are satisfactory, but the rapidity of the giemsa blood stain method (2 minutes) gives it a decided preference. This entire technique, including the dissection of the male and the preparation and staining of the spermatozoa, can be accomplished easily within 10 minutes time if the drying process is hastened by warming the slides over a spirit lamp. The spermatozoa adhere tightly to the glass slides and do not require a mounting medium nor a cover slip. Prepara-

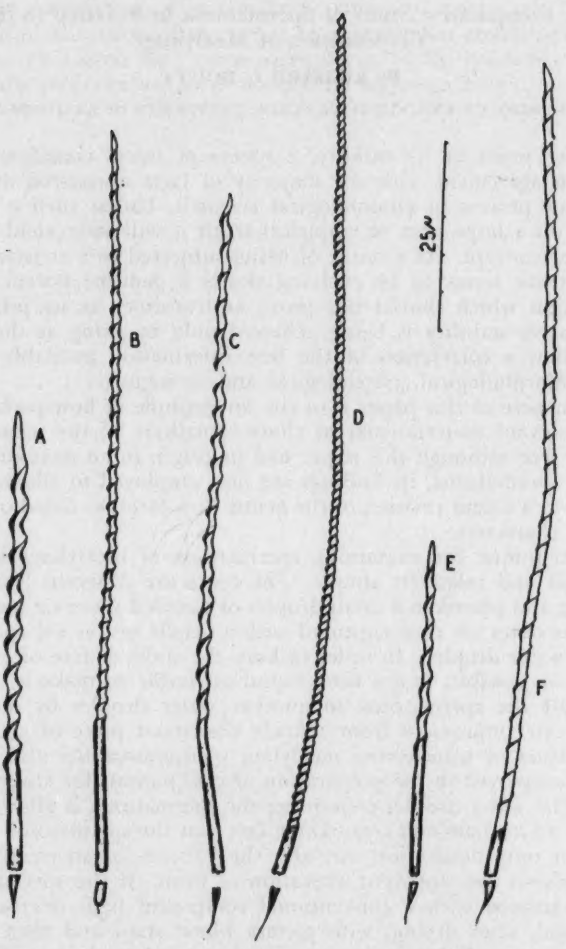

Figure 1. Diagram of mealybug spermatozoan heads and endpieces. **A.** *Spilococcus implicatus;* **B.** *Planococcus citri;* **C.** *Nipaecoccus aurilanatus;* **D.** *Pseudococcus maritimus;* **E.** *Dysmicoccus timberlakei;* **F.** *Phenacoccus gossypii.*

tions have remained without apparent change for over two years and may last indefinitely.

Photomicrography has been used extensively in the study of these spermatozoa. The line drawings of sperm heads in Figure 1 were made directly on matte-surfaced prints of photomicrographs. (The end pieces shown in the same figure are entirely diagrammatic, however.) In order to maintain true proportions and size relationships between species, the photomicrography in this investigation was standardized by using exactly the same magnification on the film and identical enlargements of negatives each time a spermatozoan type was studied. Normal illumination with a ribbon filament was used for the most part, although dark field illumination was helpful at times in demonstrating certain structures. Although electron microscopy also was used to advantage in disclosing the true nature of some of the smaller features, the mealybug spermatozoa are relatively opaque to the electron beam, and internal fibrillated structure is more readily studied with a conventional light microscope.

The spermatozoa of mealybugs seem to possess in common a basic morphological formula. This consists of a spiral or auger-shaped head followed by a long cylindrical flagellate tail composed of a cytoplasmic envelope surrounding a group of intertwined fibrils. This tail may constitute as much as 90 per cent of the total length of the spermatozoon and normally terminates in a slender filament, the endpiece. All of the first three species of mealybugs studied showed strikingly different variations of this basic pattern of spermatozoan form. This induced the publication of a preliminary note in which these interesting differences were illustrated and in which the possibility of employing spermatozoa as diagnostic tools in mealybug taxonomy was suggested (Doutt, 1949).

Subsequently, as more species of mealybugs were obtained for study it became evident that the differences between spermatozoa did not consistently hold at the species level as was earlier supposed. Instead, it was possible to group species having spermatozoa of similar appearance, and it was obvious that if the comparison of spermatozoan types was to have any meaning it would be in relation to a higher category than the species.

In 1950 Ferris revised the North American members of the genus *Pseudococcus* largely on the basis of knowledge which had accumulated from years of study of female mealybug morphology. In doing so he wrote the following paragraphs:

"Out of the species that have been referred to this genus in North America a number of genera will be made. The genus *Pseudococcus* itself will be reduced to less than 10 species. Unfortunately, in this process a few of the common and economically important species which have long passed under this generic name will be transferred to other genera, the most unfortunate of these changes involving *citri* and *brevipes*.

"How large the genus *Pseudococcus* will be when it has been adequately studied for the entire world remains to be seen. It is probable that some modification of the definition as here presented will be forced by such a study, but the examination of a considerable amount of ma-

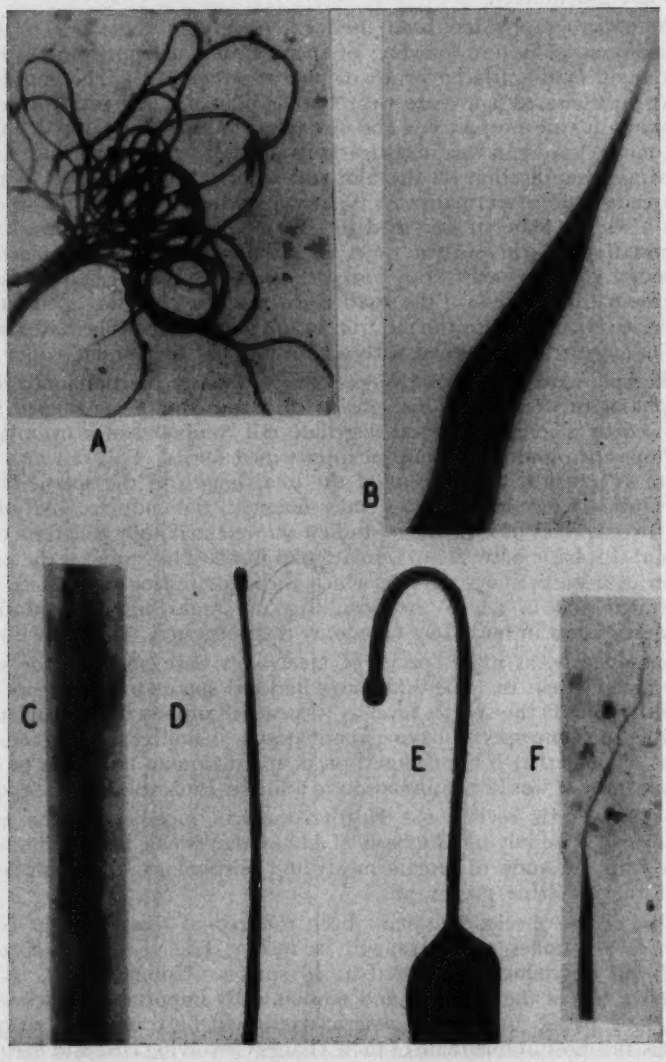

Figure 2. A. Fibrils fraying from broken spermatozoan tail of *Spilococcus implicatus*. **B.** Tip of spermatozoon of *Planococcus citri*. (Taken with electron microscope.) **C.** Intertwined fibrils of *Spilococcus implicatus*. **D., E.** Endpieces of *Planococcus citri* (Taken with electron microscope). **F.** Endpiece of *Spilococcus implicatus*.

terial from various parts of the world encourages the belief that the definition here presented will be basically sound."

A comparison of the spermatozoan types has been made with the new generic groupings as set forth by Ferris, and some interesting and probably significant parallelisms have been found to exist. With the exception of a single species (*brevipes*) among those examined, the categories of species based on spermatozoan structure fit exactly the generic scheme proposed by Ferris on the basis of female characters. The fact that the spermatozoa which have such a basic nature and function seem to fit Ferris' scheme of classification so closely adds considerable weight towards the proof of its validity.

On the basis of similarity of spermatozoa the following species group together: *adonidum, brevipes,*[1] *gahani,* what presumably is *maleacearum,* and all races of *maritimus.* With the notable exception of *brevipes* all of these species are retained by Ferris in the genus *Pseudococcus.*

Figure 1, D, illustrates the characteristic long and tightly spiralled head of the spermatozoon common to members of the genus *Pseudococcus.* This spermatozoon has a long tail which tapers to a filamentous endpiece which is illustrated somewhat diagrammatically in Fig. 1, D.

The spermatozoon of the common citrus mealybug exhibits features which immediately distinguish it from all other spermatozoa examined. It is interesting that Ferris recognizes this species, *citri,* as a member of a distinct new genus *Planococcus.* The head and the peculiar blunt termination of the tail are diagrammed in Fig. 1, B. The very fine, short endpiece is extremely difficult to photograph by means of a light microscope and this technique was successful only when dark field illumination was used. This endpiece is easily photographed by electron microscopy, Fig. 2, D, E. Examination by electron microscopy reveals a knob-like termination of the endpiece which is not seen with a light microscope, and it may be simply an artifact induced by the evacuated condition in the electron microscope. The tip end of the spiral head, which perhaps corresponds to the acrosome of mammalian sperm, is shown under electron microscopy, Fig. 2, B, to be far more elongate and pointed than is evident under ordinary microscopic examination.

The peculiar spermatozoon which was attributed to *Pseudococcus sequoiae* (Coleman) by Doutt (1949) has since been found to belong to a closely related but new species, described by Ferris as *Spilococcus implicatus.* The head and endpiece are shown diagrammatically in Fig. 1, A. This spermatozoon is somewhat more gross than spermatozoa of other species and is particularly suitable for demonstrating the internal fibrillated nature of the tail. When the cytoplasmic envelope of the tail is ruptured the enclosed fibrils fray out as is shown in the photomicrograph Fig. 2, A. The manner in which they are intertwined is shown in Fig. 2, C. The tapering tail and filamentous endpiece typical

[1] The author is grateful to K. S. Hagen who prepared mounts of spermatozoa from male *brevipes* supplied to him by the staff of the Pineapple Research Institute in Honolulu, Hawaii.

of most mealybug spermatozoa is pictured in Fig. 2, F. Quite often a vacuolated area appears in spermatozoa just anterior to the origin of the endpiece.

The golden mealybug, now considered to be *Nipaecoccus aurilanatus* (Maskell), possesses a spermatozoon different from other members of the old genus *Pseudococcus* with which it was formerly associated, Fig. 1, C.

An examination of spermatozoa from *Dysmicoccus timberlakei* (Cockerell) showed them to be quite distinct from any of the above genera, although the spermatozoan type is somewhat similar to *Spilococcus implicatus* Ferris. The spermatozoan type of *Dysmicoccus* has also been found in a number of unidentified mealybug males collected on filaree in the Coalinga foothill area of California. Ferris considers *brevipes* to be a member of the genus *Dysmicoccus,* and as indicated above this is the only exception yet found to a perfect conformity between mealybug genera and spermatozoan types.

Phenacoccus gossypii Townsend and Cockerell has a spermatozoon of the type shown in Fig. 1, F. The head of this spermatozoon is quite long, being comparable to the length of the head possessed by spermatozoa of species in the present genus *Pseudococcus.* The core of the spiral head seems to be more definite in *Phenacoccus* than in the other genera studied and the spiral whorls seem to be somewhat superimposed on it. It is interesting to note that as great if not greater differences seem to exist between spermatozoan types within the members of the old concept of *Pseudococcus* than between some of these members and the long recognized genus *Phenacoccus.*

Thus on the basis of the specimens examined, with one noted exception, it would appear that distinct structural differences in spermatozoa serve to separate the mealybug genera *Pseudococcus, Planococcus, Spilococcus, Dysmicoccus, Nipaecoccus* and *Phenacoccus.*

It is of interest to note that such differences in spermatozoa do not exist with all insect groups. A great number of species of Coccinellidae have been examined, and in these beetles no difference in sperm structure is evident even between tribes. The coccinellid spermatozoon is similar to other coleopteran spermatozoa, but is extremely different from the spermatozoa of mealybugs. Coleopteran spermatozoa lack a spiral head and seem to be characterized by possessing a strong axial filament which supports an undulating membrane. In mealybugs the interwoven fibrils apparently contract in a time-sequence manner and thus impart a sinusoidal movement to the cylindrical flagellate tail.

Summary. A comparative study of mealybug spermatozoa has revealed that groups of species possess a common type of spermatozoon. With the exception of a single species among those examined, these categories of species based on spermatozoan similarities conform closely with the generic classification proposed by Ferris (1950). The fact that the structural types of such fundamental cells are so closely correlated with the grouping of species in the presently recognized genera adds

considerable evidence in support of Ferris' revision of the genus *Pseudococcus*.

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Two new Species of Anagyrus (Hymenoptera: Encyrtidae)

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An examination of coconut palms on the islands of Saipan, Anatahan, and Alamagan in the Marianas during 1948 revealed infestations of *Pseudococcus saipanensis* Shirawa. This mealybug was found to be parasitized by a new species of *Anagyrus* which is described as follows:

Anagyrus saipanensis Doutt, sp. n.

Female.—Head dorsal view twice as wide as long, anterior margin gently concave between orbits, occipital margin less concave, nearly straight; inner orbits gently diverging anteriorly from posterior ocelli, more strongly divergent posteriorly; frontovertex slightly longer than wide, ratio 6:5, occupying slightly more than one-third width of head; ocelli in equilateral triangle, lateral ocelli slightly more than their own diameter from orbits and equidistant from occipital margin. Head frontal view slightly wider than high, 13:11; eyes hairy, descending three-fourths depth of head; cheeks short, convergent below. Antennal sockets closer to oral margin than to orbits, sockets with upper margins tangential to basal ocular line; scrobes slightly convergent above, separated by rounded facial prominence. Frontovertex, face with minute hairs, very minutely alutaceous, yellowish. Ocelli deep red, eyes purplish black; lower cheeks black.

Antenna as in Fig. 1D; antennal scape flattened, ventral expansion moderate for genus, over twice longer than wide, slightly longer than pedicel and first funicle segment combined, white with diagonal black band across middle and small black areas at base and apex. Pedicel over twice longer than wide, longer than any funicle segment, narrower than funicle segments 5, 6; basal half black, distal half white. Funicle joints increasing slightly in width and decreasing slightly in length distad; funicle 1 black, funicle segments 2, 3, 4, white, funicle 5 variable, usually brown, but nearly white in one specimen, funicle 6 dark brown to black. Club slightly wider than funicle, equal in length to first two funicle segments combined, shorter than scape, shorter than three preceding segments, yellowish.

Pronotum short, testaceous, lighter than mesoscutum; scutum alutaceous, with numerous short hairs, with distinctive sculpturing in specimens mounted in gum damar, Fig. 1E, posterior margin with slight median bulge almost covering tips of axillae which are nearly contiguous; scutellum slightly wider than long, apex sharply rounded, nearly pointed. Abdomen as long as head and thorax combined, narrowly triangular, surface sculptured with fine reticulations; ovipositor shortly exerted. Dorsum of thorax and abdomen light brown, except as noted.

Forewings hyaline, extending to tip of abdomen, densely covered with small setae except for speculum divided centrally into 2 parts by transverse setaceous band of about 6 rows of setae; submarginal vein with row of stiff erect bristles, terminates distally at hyaline break before marginal vein; costal cell present but narrow; stigmal vein longer than marginal and postmarginal veins combined.

Legs white except for testaceous hind coxae; tarsi lightly testaceous, apical segment darker. Spur of middle tibiae slightly shorter than basitarsus, the latter as long as four succeeding segments together.

Male.—Head dorsal view twice as wide as long, anterior margin gently convex between orbits, occipital margin slightly concave; frontovertex wider than long, wider than transverse width of eyes; head frontal view with inner margins of eyes more divergent ventrally than in female, face relatively broader; color and sculpturing as in female.

Thorax similar to female; abdomen very short, triangular. Antenna as in Fig. 1C; scape moderate for genus; pedicel small, normal; first two funicle segments subequal, longer than following segments, funicle segments 3 and 5 subequal, longer than 4 and 6,

Fig. 1. A. Antenna of female *Anagyrus smithi*. **B.** Antenna of male *A. smithi*. **C.** Antenna of male *A. saipanensis*. **D.** Antenna of female *A. saipanensis*. **E.** Detail of sculpturing on scutum of female *A. saipanensis*.

the shortest funicle segments; club as long as combined lengths of 2 preceding segments, pointed, no wider than average width of funicle. Funicle with long stiff, brittle setae. Radicle black; scape white except for black area on apical part of dorsal surface; pedicel, funicle, and club dark brown.

Forewings similar to female, but relatively broader; speculum interrupted by narrower setaceous band.

From 5 ♀ ♀ and 7 ♂ ♂ reared from *Pseudococcus saipanensis* Shirawa at Alamagan, Marianas Islands, August 4, 1948, R. L. Doutt.

Types and paratypes in the collection of the Division of Biological Control, University of California. A series of paratypes deposited in the entomological collection of the Hawaiian Sugar Planters' Association, Honolulu.

A. saipanensis sp. n. apparently belongs in the subgeneric group including *saccharicola* Timberlake and *swezeyi* Timberlake, from which it may be most easily distinguished by antennal characters. It has fewer affinities with the African *subproximus* group. The antennal characters readily separate *saipanensis* from all the species of Japan given in the key by Ishii (1928).

A common mealybug on cypress around the San Francisco Bay area of California is *Spilococcus implicatus* Ferris. This mealybug is parasitized by *Cirrhencyrtus ehrhorni* (Timberlake), *Pseudaphycus angelicus* (Howard), and by at least one new species of *Anagyrus* which is described as follows:

Anagyrus smithi Doutt, sp. n.

Female.—Head dorsal view over two and one-half times as wide as long, anterior margin convex between orbits, occipital margin concave; frontovertex wider than long occupying about one-half width of head. Posterior ocelli separated by greater distance than that from anterior ocellus to either posterior ocellus. Posterior ocelli located near occipital margin, farther from compound eyes. Head frontal view about as wide as high; eyes descending slightly over one-half depth of head; cheeks relatively long. Antennal sockets about equal distance from oral margin and margin of compound eyes, sockets with upper margins slightly above basal ocular line, sockets separated by rounded facial prominence. Face with reticulate sculpturing. Frontovertex yellowish orange, ocelli red, eyes greyish purple, hairy, cheeks and face black.

Antenna as in Fig. 1A; scape flattened, nearly three times as long as wide, subequal to length of club, white with conspicuous black band across middle and black area extending from band on dorsal surface to apex. Pedicel dusky with black dorsal surface, about equal in length to funicle segment 6. Funicle segments and club dusky, funicle segments of equal width but decreasing in length apically, so that funicle 1 is noticeably longer than funicle 6. Club and funicle of equal width.

Pronotum short, black dorsally becoming orange at lateral margins. Scutum, axillae, scutellum yellowish orange. Axillae large, prominent. Scutellum with two longitudinal rows of three conspicuous black setae near apex. Dorsal aspect of metanotum and propodeum dark. Lateral and ventral areas of thorax yellowish orange.

Wings hyaline. Forewings with hairless streak extending obliquely and posteriorly from beneath stigmal vein towards basal portion of wing. This speculum interrupted by discal cilia before reaching either stigmal vein or posterior edge of wing. Stigmal vein slightly longer than marginal and postmarginal combined. Submarginal vein with distinct hyaline break before attaining marginal vein. Posterior wing with narrow costal cell; discal cilia beneath venation sparse, fine, but coarse and abundant beyond venation to wing apex.

Legs pallid except tibiae and tarsi of hind legs, foretarsi, and last tarsal segments of middle legs, which are dusky. Fore tibia no longer than combined lengths of foretarsal segments. Basal tarsal segment on fore and hind legs about equal to combined length of any other two tarsal segments. On middle legs basal tarsal segment relatively long, as long as combined length of following 4 tarsal segments, almost twice length of saltatorial spur.

Abdomen, propodeum, and metanotum concolorous.

Male.—Head dark brown to black. Dorsal structures of thorax similarly colored, but scutum and scutellum with blue and purple reflected highlights. Lateral and ventral aspects of thorax as in female. Abdomen dark brown. Legs colored as in female. Antenna as in Fig. 1B.

This species runs out near *A. nigritus* (Howard) in the key to the species of *Anagyrus* occurring in California published by Compere (1947). *A. smithi* is readily distinguished from *nigritus*, however, by noticeably wider forewings and the obvious color differences.

From 4 ♀ ♀ and 6 ♂ ♂ reared from *Spilococcus implicatus* Ferris at Albany, California, November 1, 1950 by L. Andres. Types and paratypes in the collection of the Division of Biological Control, University of California. This species is named in honor of Professor Harry S. Smith.

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Some Observations on the Fern Weevil (Syagrius fulvitarsis Pascoe) in the Kilauea Volcano Region of Hawaii National Park with Notes on Parasitism

By C. J. DAVIS

The introduced fern weevil was first discovered on the island of Hawaii at Hilo, by Brother Mathias Newell in 1908. It was previously discovered on Oahu in 1903, according to W. M. Giffard, and was observed on Maui for the first time on May 22, 1922.

The weevils apparently arrived in Honolulu in some potted plant material from Australia and were probably distributed to Hawaii from Oahu in the same manner. Fullaway ("The Fern Weevil," The Hawaiian Forester & Agr., 18, no. 5: 101-114, 1921) wrote (p. 102): ". . . It has now spread over the entire town [of Hilo] from Wainaku to Waiakea, in the fish-tail and Boston ferns, was recently discovered infesting Sadleria ferns at Kilauea, and is also reported from Ninole, seventeen miles north of Hilo on the railroad." About 1941 L. W. Bryan, Associate Forester, Hawaii, reported that the weevil had spread through forest reserve areas on Mt. Hualalai and killed the fronds on ferns over an area of about one-half mile.

In August of 1941, the writer made some brief observations on the fern weevil and noticed that the Sadleria ferns (*Sadleria cyatheoides*) were severely damaged in the administrative and residential areas, at the Hilo entrance to the park, and in the summer camp area. The preferred host was *Sadleria cyatheoides* and in heavy infestations the young shoots were either malformed or killed. The older fronds were sickly and many female excavations and adult emergence holes were observed along the stems. No dead plants were found, but severely injured ferns were retarded in growth.

Observations were resumed in September, 1944, and continued throughout 1945. It was found that the weevil had spread westward along the steam bluff trail and southward along the Halemaumau foot trail where damage was particularly severe. It had also extended its range to Makaopuhi where a small area of infestation was found. On July 19, 1945, it was noticed for the first time that adult weevils were feeding on the circinate buds of *Cibotium chamissoi* at the summer camp. The small stunted ferns were abraded in many places. Here, too, there was evidence that some of the Sadleria ferns had been killed by *Syagrius fulvitarsis*, apparently causing the weevil to seek food from Cibotium ferns. No emergence holes were seen on the tree fern stipes. Studies by Fullaway and Pemberton have also indicated *Cibotium* as a host.

In general there was some improvement noted in the Sadleria ferns over their 1941 condition. This may be due to the increasing number of *Ischiogonus syagrii* Fullaway, a parasite introduced by Dr. C. E. Pember-

ton in 1921 from Australia. The parasites were liberated on the island of Hawaii and have helped to keep the fern weevil population down. Pemberton (1928) in "Parasitism of the Fern Weevil *Syagrius fulvitarsis* Pascoe, at Kilauea, Hawaii," (The Hawaiian Planters' Record, 32, no. 3: 260) showed a percentage of 30.5 based on the assumption that an average of 2.5 parasites develop on one weevil larva. Amaumau (*S. cyatheoides*) stipes of several seasons ago examined at random showed few parasite emergence holes while those of the present season's growth show a definite increase.

On December 23, 1945, four parasites were observed ovipositing on a Sadleria stipe at the summer camp. Of this number, two of the parasites were *Eupelmus epilamprops* Perkins. The latter were previously reared from fern stipes and were identified by Dr. O. H. Swezey. The *Eupelmus* parasites did not seem to mind the presence of *Ischiogonus syagrii* and oviposited in close proximity to it.

In February and March, 1946, amaumau stipes were collected at various localities in Kilauea, waxed at each end and held in boxes under room temperatures in the National Park administration building. In the following table, it will be noted that 85 per cent of the adult emergences were *Ischiogonus syagrii* and 10 per cent were *Eupelmus epilamprops*. The relationship between *Eupelmus* and the fern weevil has not been definitely established but it is probably an unrecorded parasite of the fern weevil, *Syagrius fulvitarsis*.

The author is indebted to Dr. F. G. Holdaway for encouragement in preparing this paper, and to Dr. C. E. Pemberton for reviewing the manuscript.

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Adult Emergences from 400 Fern Stipes Collected at Kilauea, Hawaii National Park

February 13 - March 17, 1946

Date	Date Coll. 2/12/46 Summer Camp (50 Stipes)			Date Coll. 2/14/46 Makaopuhi (50 Stipes)			Date Coll. 2/16/46 Park Utility Area (50 Stipes)			Date Coll. 2/21/46 Halemaumau F. Tr. (50 Stipes)			Date Coll. 3/6/46 Park Utility Area* (200 Stipes)		
	†	‡	§	†	‡	§	†	‡	§	†	‡	§	†	‡	§
2/13	5														
2/14	1			0											
2/15	1			1											
2/16	0			0			1	0							
2/17	3			0			0	0							
2/18	1			0			2	0							
2/19	1			1			3	0							
2/20	0			0			5	1							
2/22	0			0			3	0		0					
2/23	2			0			3	0		3					
2/24	1		1	0			1	0		1					
2/25	1	1		0			0	0	1	1					
2/26	1	0		0			2	1		1					
2/27	0	1		0			1	0		1					
2/28	2			0			0	0		1					
	19	2	1	2	0	0	21	2	1	8	0	0	0	0	0
3/1	4	1	0	0			2	1		2	0				
3/2	0	0	0	1			2	1		1	0				
3/3	1	0	0	0			3	1		4	0				
3/4	1	0	1	0			0	0		2	0				
3/5	0	0	0	1			0	0		0	0				
3/6	0	0	0	0			0	0		0	0		3	1	
3/7	1	0	0	1			1	0		0	0		5	1	
3/8	2	0	0	1			3	0		0	0		5	1	
3/9	0	1	0	1			3	0		0	1		4	0	
3/10	0	0	0	0			5	0		0	0		1	0	
3/11	2	0	0	0			2	0	1	0	0		2	2	
3/12	0	0	1	0			3	0	1	0	0		2	2	
3/13	3	0	0	1			0	0		0	0		8	0	
3/14	1	0	0	0			1	0		0	0		4	1	
3/15	0	0	0	0			1	0		0	0		12	0	
3/16	1	1	0	0			1	0	2	3	0		7	0	
3/17	0	0	2	0			0	0		0	0		2	0	
	35	5	5	8	0	0	48	5	5	20	1	0	55	8	0

* Note: Emergences for this locality incomplete, as writer was transferred to Maui.

†=Ischiogonus syagrii =166 or 85% of adult emergences.

‡=Eupelmus sp. = 19 or 10% of adult emergences.

§=Syagrius fulvitarsis = 10 or 5% of adult emergences.

Total =195

Flies Collected in Bait Traps

By D. ELMO HARDY

During December 1950, and January 1951, bait trap collections of flies from Oahu were turned over to me for identification by P. L. Gow. Except for one collection made at Waimanalo, all of these were from Maunawili. The bait consisted of casein hydrolysate plus a complete complement of synthetic B vitamins. Except for one sample, which was six days old, the baits were left in the field for three days. This bait was very highly attractive to blow flies of the genus *Chrysomyia* and to many other scavenger flies. Each sample studied consisted of about three-fourths of a quart of flies. The great bulk of these collections was made up of Calliphoridae. The bait was most attractive to the females of all of the species which were seen in the samples. Eighty-five to ninety-five per cent of the specimens were females.

Because of the very large numbers of individuals involved, actual counts of the specimens were not made. The criteria for recording the relative abundance per sample of the species are as follows: Very abundant = one thousand + to many thousands of individuals; abundant = one hundred + to one thousand; moderate = ten to one hundred; scarce = less than ten individuals seen. Approximately two-thirds to three-fourths of each sample was sorted as carefully as possible so that a fair cross-section could be obtained.

The following Diptera were observed in these collections:

CALLIPHORIDAE

Chrysomyia megacephala (F.), very abundant.
C. rufifacies (Macquart), abundant.
Rhinia testacea Robineau-Desvoidy, scarce.

MUSCIDAE

Fannia pusio (Wiedemann), moderate to abundant.
Atherigona excisa trilineata Stein, abundant to very abundant.
A. hendersoni Malloch, abundant (none in the collection from Waimanalo).
Ophyra nigra (Wiedemann), moderate.
Limnophora arcuata Stein?, scarce to moderate.
Musca domestica L., scarce to moderate.
Synthesiomyia brasiliana Brauer and Bergenstamm, scarce.
Genus and species?, scarce.

SARCOPHAGIDAE

Sarcophaga orientaloides Senior-White, moderate.
S. peregrina Robineau-Desvoidy, scarce.

DROSOPHILIDAE

Drosophila melanogaster Macquart, scarce to moderate.
Drosophila spinofemora Patterson and Wheeler, moderate.
Drosophila busckii Coquillett, scarce to moderate.
Drosophila immigrans Sturtevant, scarce to moderate.
Drosophila mercatorum Patterson and Wheeler, scarce.
Drosophila ananassae Doleschall, scarce.
Drosophila repleta Wollaston, scarce.
Drosophila n. sp.? (native), scarce.
Drosophila n. sp.?, scarce.
Gitona perspicax (Knab), scarce.

TEPHRITIDAE

Dacus dorsalis Hendel, 10-15 per sample.
D. cucurbitae Coquillett, scarce (1 seen).

CHLOROPIDAE

Cadrema pallida (Loew), moderate.
Rhodesiella scutellata (Meigen), moderate.
Siphunculina signata Wollaston, scarce to moderate.
Chlorops (sens. lat.) sp.?, moderate.
Gaurax (sens. lat.) **bicoloripes** Malloch?, moderate.

OTITIDAE

Euxesta quadrivittata Macquart, scarce.
Chrysomyza aenea Grimshaw, scarce.

SYRPHIDAE

Volucella (Ornidia) obesa (F.), scarce.

CULICIDAE

Culex quinquefasciatus Say, scarce.

CHIROMYIDAE

Chyromyia sp? related to **flava** (L.), scarce.

MYCETOPHILIDAE

Genus and sp.? (poor condition), scarce.

PHORIDAE

Megaselia scalaris Meigen, scarce.
Puliciphora ?, scarce.

SPHAEROCERIDAE

Limosina punctipennis (Wiedemann), scarce.

PIOPHILIDAE

Piophila casei (L.), scarce.

LONCHAEIDAE

Lamprolonchaea aurea (Macquart), scarce (1 specimen seen).

This is the first record of the family Lonchaeidae occurring in Hawaii. This same species has been seen recently in a collection from Canton Island. This will be reported as soon as the collection is worked up.

The Chloropidae genera *Chlorops* (sens. lat.) and *Gaurax* (sens. lat.) have not been previously recorded from Hawaii. These were identified by C. W. Sabrosky of the U. S. National Museum who says he may be able to place the *Chlorops* after he has studied it more completely. The species which I sent to him under the tentative identification of *Gaurax?*, he indicated as *"Oscinosoma" bicoloripes* Malloch. He made the following comments regarding this species: "The other is also a generic problem. Tentatively these specimens seem to be the same as *bicoloripes* described by Malloch from the Marquesas (Bishop Mus. Bull. 114: 30, 1935). Malloch described this as *Oscinosoma,* but this is far off. In later publications he called this group *Botanobia,* which is closer. *Gaurax* (sens. lat.) is the best at the moment. This group is very common in the South Pacific and I have a number of species before me."

It is interesting to note that seven out of the ten known introduced species of *Drosophila* were present in these collections.

New Species of Opius (Hymenoptera: Braconidae)

By D. T. FULLAWAY

As a result of further searching for fruit fly parasites in hitherto unworked territory, two undescribed species of *Opius* have recently come to our attention; their descriptions follow. The types of these two species will be deposited in the U. S. National Museum.

Opius angaleti n.sp.

Female—Length 4 mm., smooth and shining, sparsely clothed with silvery hairs; particolored, the head and thorax to the metathorax (including fore legs except tips of tarsi) ferruginous, propodeum and abdomen black, sparsely punctuate with microscopically fine setigerous punctuations, face especially closely beset; eyes, ocellar space, antennae, mandibles apically, mid and hind legs, sheaths of ovipositor also black.

Head transverse, more than twice as wide as long viewed from above, wide between the eyes, which are short-oval and convex; ocelli near the middle of the vertex arranged in the form of an obtuse triangle and with a depression on the outer face, distance between the lateral members greater than the distance between the lateral and anterior member, distance between the lateral members and the inner margin of the eye about one and three-fourths times that between the centers of the lateral members; antennae longer than the body, inserted on the frons not too far apart (not much further removed from eye than from each other), the sockets deep with elevated rim; 48-segmented, scape and pedicel stout, the flagellum filamentous; face a little wider than long, slightly bulged in the middle, clypeus rather indistinctly separated, with anterior margin only slightly convex, hind margin curved to semicircular form but only the pits and groove in front well-marked; cheeks fairly wide, mandibles stout, curved and apically toothed, base nearly as wide as distance to margin of eye, temples receding.

Thorax robust, half again as long as deep or wide, and as wide as the head, sides of the pronotum deeply sulcate, mesothoracic scutum convex with deep parapsidal furrows converging and uniting in a short and rather wide fovea which extends almost to the posterior margin of the mesoscutum; transverse prescutellar sulcus fairly wide and deep and divided by a median costa, each half is further subdivided by two very weak costae; scutellum triangular, slightly convex on top and declivous at the sides, the deep depression here with a smooth unstriated surface, metanotum a transverse band with front and hind margins carinate, a partially costate furrow lying between on either side of a median knob or button; propodeum transverse, twice as wide as long, convex, with sloping sides and a median longitudinal carina on either side of which the polished surface is strongly pitted or wrinkled as far as the lateral margin and quite hairy; stigmata small and round; mesopleura marked with a costate groove anteriorly and a foveate depression posteriorly, at about the middle depth; metapleura convex, smooth and shining, sparsely punctuate above, hairy below.

Abdomen elongate-ovate, as long as the head and thorax together, somewhat compressed apically, the sides anteriorly collapsed, smooth and polished throughout save for some weak striation on the apical half of 1st tergite and basal half of the 2nd; 1st tergite one and one-half times as long as apically wide, the apical width about one and one-half times the basal; between the strong sublateral carinae the base is deeply hollowed; 2nd tergite transverse, one and one-half times as wide as long, separated from first by a deep sulcus which is incomplete laterally and is broken medially by a knob-like extension of the anterior margin; the sides are discolored, from black to a pale straw-yellow; following five tergites indistinctly marked and only discerned by the transverse line of silvery hairs near the posterior margins; ovipositor exserted and longer than the entire insect body. Legs rather slender, the hind pair a little longer and thicker than preceding. Wings slightly dusky, stigma and veins black, radius in anterior wing arising near the middle of the stigma, which is lanceolate, 1st abscissa hardly half

stigma's width in length, 2nd abscissa three times as long as first, but not as long as first intercubitus; first cubital cell is pedicellate, and second, with base one and one-half times top, is five-sided; recurrent nervure is not quite as long as first intercubitus or second abscissa of radius; nervulus in front wing is post-furcal; nervus parallelus intersecting below the middle on median; post-nervellus present in hind wing.

Male—Similar to female in all but sexual characteristics.

Described from 8 female and 17 male specimens (type, allotype and paratypes) reared from fruit fly pupae collected in North Borneo by G. W. Angalet (for whom the species is named) in March and April 1951.

Opius hageni n.sp.

Female—Length 3.5 mm., smooth and shining, sparsely clothed with silvery hairs; particolored, the head, thorax and anterior part of abdomen (1st segment entirely and 2nd partly, that is, middle portion of tergite) testaceous-ferruginous, basal segments of antennae, legs (except the hind tibiae which are dusky) also testaceous-ferruginous; remainder of abdomen black; eyes, flagella of antennae apically, tips of mandibles and tarsi and sheaths of ovipositor, except middle portion, also black or blackish; sparsely punctuate with microscopically fine setigerous punctuations, face especially closely beset.

Head transverse, more than twice as wide as long, viewed from above, wide between the eyes, which are short-oval and convex, ocelli near the middle of the vertex, arranged in the form of an obtuse triangle and with a slight depression on the outer face, distance between the lateral members twice that between the lateral and anterior member, distance between the lateral member and the inner margin of the eye about one and one-fourth times that between the centers of the lateral members; antennae longer than the body, inserted on the frons not too far apart (about the same distance apart as to eye margin), the sockets deep with elevated rim, 47-segmented, scape and pedicel stout, the flagellum filamentous, face a little wider than long, slightly bulged in the middle, clypeus rather indistinctly separated with anterior margin only slightly convexly curved, hind margin curved to semicircular form but only the pits and groove in front well marked, cheeks fairly wide, mandibles stout, curved and apically toothed, width of base less than distance to margin of eye, temples receding.

Thorax robust, half again as long as deep or wide and as wide as the head, sides of the pronotum deeply sulcate, mesothoracic scutum convex with deep parapsidal furrows converging and uniting in a short and rather wide fovea which extends almost to the posterior margin of the mesoscutum, transverse prescutellar sulcus fairly wide and deep and divided by a median costa, scutellum triangular, slightly convex on top and declivous at the sides, the deep depression here with a smooth unstriated surface and a line of small pits on the posterior margin, metanotum a transverse band with front and hind margins carinate, a partially costate furrow lying between on either side of a median knob or button, propodeum transverse, twice as wide as long, convex with sloping sides and a median longitudinal carina stemming a pentagonal areola, the base of which coincides with posterior margin; on either side the surface is strongly pitted or wrinkled as far as the lateral margin; stigmata small and round; mesopleura marked with a costate groove anteriorly and a foveate depression posteriorly at about the middle depth; metapleura convex, smooth and shining, with a wide costate furrow above, hairy below.

Abdomen elongate-ovate, as long as the head and thorax together, somewhat compressed apically, the sides anteriorly collapsed, smooth and polished throughout; 1st tergite one and one-half times as long as apically wide, the apical width about one and one-fourth the basal; between the strong sublateral carinae the base is deeply hollowed, apically ligulate, side pieces depressed; separated from the following tergites, which are indistinctly marked, by a deep sulcus which is incomplete laterally and is broken medially by a knob-like extension of the anterior margin of 2nd tergite; tergites 3-6 inclusive have a transverse line of silvery hairs near posterior margins; ovipositor exserted and longer than the entire insect body; legs rather slender, the hind pair a little longer and thicker than preceding pairs. Wings strongly infumate, the stigma and veins black, radius in anterior wing arising before the middle of the stigma, which is fairly wide, the first abscissa hardly half stigma's width in length, 2nd abscissa three times as long as 1st but not as long as 1st intercubitus; 1st cubital cell is pedicellate, and 2nd with

base one and one-half times top, is five-sided; recurrent nervure is not quite as long as 1st intercubitus or 2nd abscissa of radius; nervulus in front wing is postfurcal; nervus parallelus intersecting below the middle on median; post-nervellus present in hind wing.

Male—Similar to female in all but sexual characteristics.

Described from 8 female and 8 male specimens (type, allotype and paratypes) reared from *Dacus passiflorae* (Froggatt) in *Ochrosia* fruits collected at Ndeumba, Viti Levu, Fiji, May, 1951, by N. L. H. Krauss.

This species is believed to be the parasite of *Chaetodacus passiflorae* Froggatt noted by H. W. Simmonds ("Fruit Fly Investigations, 1935." Bull. 19, Dept. of Agr., Fiji, 1936; p. 10 and Plate 4, Fig. c) as *Biosteres* sp. *Opius hageni* is named for Kenneth S. Hagen of the Department of Entomology, University of California staff, who had a prominent part in the oriental fruit fly investigations in Hawaii in 1950-51.

Opius vandenboschi new name

Biosteres javanus Fullaway, 1920, Proc. Hawaiian Ent. Soc., 4:260, preoccupied.

Biosteres javanus Fullaway, 1920, is preoccupied by *Opius javanus* Szépligeti, 1908 (Leiden, Notes Mus., 29:231). *Biosteres* and *Diachasma* are both synonyms of *Opius*, according to Gahan (Proc. U. S. Nat. Mus., 49:63, 1915). For a time I considered that my *B. javanus* might be *Biosteres persulcatus* Silvestri, but now I am convinced that it is a distinct species. A name for this species is desirable because of the considerable information already published on it by Hawaiian workers under such make-shift designations as "near *persulcatus*" and "presumably *persulcatus*," and because of future studies which may be made on this important species. The specific name *Opius vandenboschi* is hereby proposed to replace *Opius javanus* (Fullaway), 1920. The species is dedicated to Dr. Robert van den Bosch, whose investigations have contributed greatly to the clarification of the relationships of the closely allied forms of the *persulcatus* group of *Opius*.

Two new Spider Egg Predators from the Hawaiian Islands (Diptera: Drosophilidae)

By WILLIS W. WIRTH

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AGRICULTURAL RESEARCH ADMINISTRATION, U. S. DEPARTMENT OF AGRICULTURE

While rearranging the collection of Drosophilidae in the U. S. National Museum, I discovered a short series of flies from the Hawaiian Islands which apparently belong to an undescribed species of *Titanochaeta*. This genus was erected by Knab (1914, Insecutor Inscitiae Menstruus 2:168) for a single species, *ichneumon* Knab, which had been reared from spider egg-sacks on sugar cane from Mountain View, Hawaii.

Through the courtesy of D. Elmo Hardy and E. H. Bryan, Jr., some of the drosophilids which Swezey reported in 1929 (Proc. Hawn. Ent. Soc. 7:292) that he had reared from spider egg cases from Oahu, were located and borrowed for study from the Bishop Museum collection. These also prove to be new and are described below.

With the discovery of these two additional species it is reasonably apparent that *Titanochaeta* is an endemic genus in Hawaii, another case of a very ancient natural introduction having broken up into species on different islands. It would be very interesting to make collections from other islands to determine how far this speciation has gone.

Titanochaeta swezeyi Wirth, new species

♂, ♀. Length about 3 mm., wing 2.7 mm.

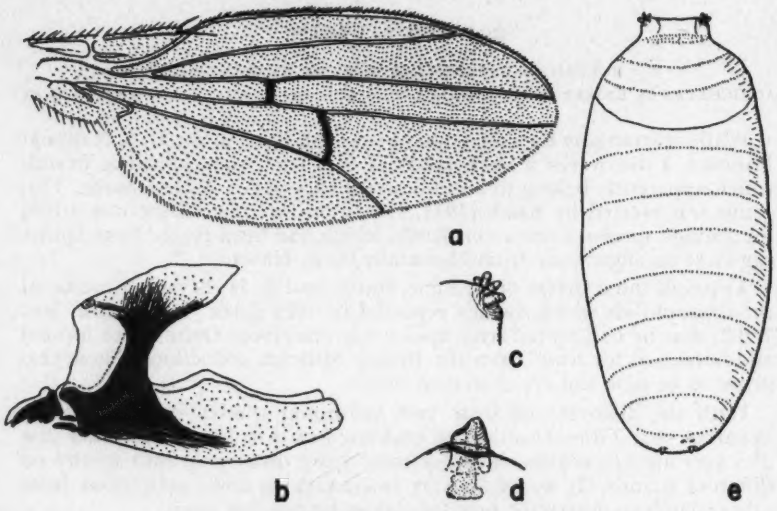
Subshining yellow, bristles and hairs black; face, cheeks, mesonotum, scutellum and pleura whitish pruinose; frons more or less dull brownish-yellow, ocellar triangle and frontal orbits whitish pruinose; abdomen brownish above; wings brownish hyaline, the veins yellowish, both crossveins dark brown.

Frons a third as wide as head, slightly converging toward antennae; ocellar triangle and orbits well differentiated but not raised, with sparse, fine short hairs; middle fronto-orbital bristle three-fourths as long as the anterior, half as long as posterior fronto-orbital, much stronger than in *ichneumon*. Antenna entirely yellow, arista with only two or three rays. Face not as concave as in *ichneumon*, the median carina distinct; cheeks broader, about a fifth of eye height in male, slightly narrower in female; postocular hairs stronger. Eyes with interfacetal hairs rather sparse and short.

Humeri each with a strong bristle and a second shorter one just below; sternopleuron with two strong bristles and a few fine hairs. Mesonotal hairs coarse, suberect and non-seriate; scutellum with anterior marginals divergent, slightly longer than the strong, cruciate, posterior pair; four or five short hairs on each side of scutellum. Legs with strong posterior bristles on fore femora, otherwise as in the genotype.

Female wing with second section of costa 2.8 times as long as third (costal index); ultimate section of fourth vein 3 times as long as the penultimate section (fourth vein index); hind crossvein 0.75 times as long as penultimate section of fourth vein and 0.75 times as long as ultimate section of fifth vein. Male wing (figure 1 a) with costal index 2.7, fourth vein index 4 to 5, and the hind crossvein much more oblique, being 1.1 times as long as penultimate section of fourth vein and 0.6 times as long as ultimate section of fifth vein. End of first section of costa with two long, differentiated bristles.

Holotype ♀, allotype, and 1 ♂ and 1 ♀ paratype, Haiku, Maui, Hawaiian Islands, August, 1918, J. C. Bridwell (ex spider egg mass) (Type no. 61314, U. S. National Museum). One ♀, from Mt. Tantalus, Oahu, O. H. Swezey (ex spider eggs), from the Bishop Museum collection agrees very well with the type series from Maui.



EXPLANATION OF FIGURE

Fig. 1. *Titanochaeta swezeyi.* **a,** right wing of male; **b,** cephalopharyngeal skeleton of larva; **c,** anterior spiracle; **d,** posterior spiracle; and **e,** dorsal view of puparium.

Several empty puparia from which this series was reared, were imbedded in the loose, woolly egg-sack of the spider. From these the following descriptions are offered of the puparium and the cephalopharyngeal apparatus of the larva:

Puparium (figure 1 e) 3 mm. long; ovoid, subcylindrical; color amber yellow; surface smooth, with sparse rows of minute, conical spinules on segmental margins. Extreme cephalic end abruptly narrowed and compressed dorsoventrally in a transverse anterior carina about a third as wide as greatest width of puparium. Anterior spiracles borne on anterolateral angles of this carina, each (figure 1 c) consisting of four sessile, tube-like papillae arising fan-wise in a dorsoventral line. Puparium evenly rounded caudad; posterior spiracles (figure 1 d) arising slightly above dorsoventral midline, bases separated by a distance of a fifth of greatest width of puparium, each spiracle in form of a truncated cone, slightly hollowed on inner apex, the spiracular opening apparently in an arc on the inner side before the apex.

Cephalopharyngeal skeleton of the larva as in figure 1 b. Mouth hooks (mandibular sclerites) paired, heavily sclerotized, each with a long distal

tooth, a shorter subapical tooth and two subequal, smaller teeth at base. Two pairs of small, bar-like sclerites lying below bases of mandibles and in front of the blunt, heavily sclerotized, anterior arms of the pharyngeal plates. Posteriorly the skeleton consisting of a pair of vertical pharyngeal plates connected below by a very slender, but heavily sclerotized, transverse band between the anterior arms. (This hypostomal bridge serves to identify these portions of the anterior arms as the hypostomal sclerites which in most drosophilid larvae are separate, slender sclerites, but here have fused with the pharyngeal plates.) Each pharyngeal plate is divided by a deep posterior cleft into broad dorsal and posterior wings or cornua, the posterior margins of which are gradually less heavily sclerotized. Dorsal wings connected above by a hyaline membrane bearing a small, round, brownish sclerotized, sensory area on the midline in front.

Titanochaeta ichneumon Knab differs in its darker, pruinose gray thorax, more pubescent eyes, shorter mid fronto-orbitals, dark third antennal segment, arista with five rays, single humeral and sternopleural bristles, scutellum bare except for the four strong marginals, and wing with only one strong bristle at end of first costal section, the crossveins not infuscated and much more removed from the wing margin. Male wing with costal index 2.5, fourth vein index 2.2 and the hind crossvein a third as long as penultimate section of fourth vein and 0.39 as long as ultimate section of fifth vein.

Through the courtesy of D. Elmo Hardy and C. E. Pemberton, four specimens of *ichneumon* from Pahala, Hawaii, Feb. 11, 1916, were borrowed from the Hawaiian Sugar Planters' Experiment Station and found to agree closely with the type lot. The puparia from which they had issued resemble those of *swezeyi*, except notably for the shape of the posterior spiracles. These are in the form of acute, blackened combs with the apical spiracular openings minute, about two-thirds as far apart as the anterior pair of spiracles, arising at the sides of a turret-shaped, dorsoposterior, median protuberance, about half as high as its diameter with a distinct basal constriction or neck, and with its axis at about eighty degrees with the longitudinal axis of the puparium.

Titanochaeta bryani Wirth, new species

♂, ♀. Very closely related to *swezeyi*, differing in the following particulars: Much smaller, length about 2 mm., wing 2 mm. Color as in *swezeyi*, but crossveins of wing not infuscated. Middle fronto-orbital shorter, half to two-thirds as long as the anterior, and a third to a half as long as the posterior fronto-orbital. Arista with two (in one antenna) or three (in five antennae) rays. Mesonotal setulae in distinct series near midline, non-seriate toward sides. Wing more nearly as in *ichneumon;* female wing with costal index 2.5; fourth vein index 1.6, due to the anterior crossvein being remarkably removed toward base of wing; hind crossvein 0.31 times as long as penultimate section of fourth vein and 0.56 times as long as ultimate section of fifth vein. Male wing very similar to the female, the respective indices being 2.5, 1.8, 3.3 and 0.5.

Holotype ♀, allotype, Manoa, Oahu, Hawaiian Islands, O. H. Swezey, collector (ex spider eggs) (in collection of the Experiment Station, H.S.P.A., Honolulu); 1 ♀ paratype, same data (retained for the U. S. National Museum collection). The attached puparia closely resemble those of *swezeyi*.

Drapetis insularis, a new Species from Oahu (Diptera: Empididae)

By A. L. MELANDER

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Only one species of Empididae has been recorded from the Hawaiian Islands, which I described as *Chersodromia hawaiiensis*, in 1938 ("Proceedings," 10: 57). Specimens were found about the excavation holes of crabs on the beach of Hanauma Bay, Oahu. The present species, also belonging in the sub-family Tachydromiinae of the Empididae, was submitted by Dr. D. Elmo Hardy, who reports that it was abundant, flying with *Milichiella lacteipennis* (Loew) over compost at the dairy farm on the campus of the University of Hawaii. He sent me 33 specimens for identification, and as the species is undescribed I am glad to present the following description.

Drapetis (Crossopalpus) insularis, Melander, sp. nov.

Length 2.5 mm. Entirely shining black or blackish in ground color. Front nearly parallel-sided, more or less brownish tomentose; face linear; occiput densely pale ochraceous-pollinose, the orbits entirely densely cinereous; cheeks deep, shining black below the eye-margin; two long ocellar bristles, nearly as long as the vertical pair; antennae black, the basal joint brownish, with a long bristle beneath, the outer joint rounded triangular, as long as deep; the preapical bare arista about four times the length of the antenna; proboscis black, palpi light brown. Thorax broad, round in dorsal view, shining black, the dorsum with slight æneous lustre, covered with fine short dark hairs, four small dorsocentrals, the presutural very minute, scutellum with six bristles, the intermediate pair long; two notopleural, one supra-alar bristle. Abdomen short and broad, shining black, the hairs dull yellowish and sparse, becoming longer and darker on the apical segments; pygidium large, rounded, closed, without evident appendages. Legs mostly shining black, the anterior knees, base of hind tibiæ, coxæ and trochanters castaneous, the hind tibial lappet heavily fulvous pubescent which continues on the anterior side of the metatarsus, the lappet two-fifths as long as the metatarsus, pubescence of legs scattered, not conspicuous, blackish; middle femora with a small preapical bristle on the anterior side, hind femora with two preapical bristles, anterior tibiæ each with two preapical bristles, hind tibiæ with long antero-flexor bristle near the middle and another halfway to the tip, three smaller apical bristles opposite the lappet. Wings clear hyaline, base of costa with a long black bristle, veins narrow and piceous, costal ratio 3:2:1, apical cell narrowed at apex, the fourth vein nearly straight, its basal half whitish, the anterior crossvein nearly at middle of the discal cell; halteres pale yellow.

11 males and 22 females. Honolulu, Oahu; D. Elmo Hardy and H. A. Bess, collectors. October-November, 1951. Type and allotype sent to the United States National Museum. Paratypes divided between the author's collection and that of the University of Hawaii. Dr. Hardy writes that he has taken several dozen additional specimens at the type locality.

E. O. Engel separates the subgenus *Crossopalpus* Bigot in that its species have the cheeks broadly extending beneath the eyes and two ocellars are present. There are but few dark-legged species of *Crossopalpus* (= *Eudrapetis* Melander) with which *insularis* might be confused. They may be differentiated by the accompanying table.

1. No lappet on the hind tibiæ, or at most a vestige of one 2
   A distinct lappet at apex of the hind tibiæ 4
2. Halteres pale yellow 3
   Halteres dusky; pleura shining; tibiæ merely pubescent (Europe) ..... **humilis** Frey
3. Hind tibiae with a series of about five extensor bristles; pleura shining; fourth vein nearly straight (Europe) ..... **curvipes** Meigen
   Hind tibiæ without bristles; pleura more or less pollinose; fourth vein undulate (Europe) ..... **flexuosa** Loew
4. Hind tibiæ with long fine extensor bristles and flexor pubescence 5
   Hind tibiæ without long extensor bristles 6
5. Hind femora with four pale flexor bristles (Europe, Africa, Formosa) (= *ænescens* Bezzi) ..... **pilipes** Loew
   Hind femora with one black flexor bristle (western United States) ..... **nitida** Melander
6. Hind tibiæ with a few short stiff bristles at apex; mesonotal pubescence dark 7
   Hind tibiæ without a cluster of apical bristles; a small presutural dorsocentral bristle present, mesonotal pubescence pale (Europe, Africa, Asia) ..... **aenescens** Wiedemann
7. Hind tibiæ without long bristles; no presutural dorsocentral; halteres dark (Europe) ..... **aterrima** Curtis
   Hind tibiæ with two long flexor bristles; a small presutural dorsocentral; halteres pale (Hawaii) ..... **insularis,** n. sp.

Of the Pacific Island species of *Crossopalpus, brevicula* Melander (= *brevis* Bezzi, preoccupied) has the fifth vein apically faint, and *pubicornis* Bezzi has the occiput shining black while the third antennal joint is elongate and pubescent beneath. These two species occur in Formosa and have yellow legs. *Drapetis crockeri* Curran, from the Cook Islands, also has yellow legs and the dorsal segments of the abdomen are marked with reddish.

A Key to the Genera of Drosophilidae of the Pacific Islands (Diptera)

By MARSHALL R. WHEELER

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The descriptions of the 24 genera of Drosophilidae reported from the Pacific area are widely scattered and no recent attempt has been made to include them all in a single key. The present account has been drawn up largely from published descriptions and some characters may have been stressed that are not reliable in actual practice. As several of the genera have but one species, it is also likely that some of the characters used are specific rather than generic and, consequently, some of the names included here may be synonyms of older genera. In many instances sufficiently clear-cut characters are not given in the literature and I have been unable to devise adequate contrasting couplets; in such cases a short summary of the known generic characters is given, the alternative being only the stock phrase: "Not entirely as above."

The writer has been fortunate in having access to the extensive collection of Drosophilidae of Dr. A. H. Sturtevant, Pasadena, Calif., as well as to his notes on the types of a number of Pacific species. Several of the island records are from specimens in his collection.

Key to Genera

1. Mesonotum with 3-4 pairs of strong dorsocentrals, at least one of them presutural 2
   Mesonotum with 1-2 pairs of dorsocentrals, all postsutural 7
2. Acrostichal hairs in 6 or more rows 3
   Acrostichals in 2-4 rows 5
3. Four pairs of dorsocentrals; lower margin of gena quite densely haired; size up to 6.5 mm ..... (Marquesas) **Marquesia** Malloch
   Only 3 pairs of dorsocentrals 4
4. Lower angle of face with a conspicuous row of strong black bristles curved inwards in front of face; face not carinate; costal index about 3.5; posterior crossvein strongly inclined basally ..... (Hawaii) **Hypenomyia** Grimshaw
   Not entirely as above ..... (part; all regions) **Drosophila**
5. Eyes oblique, much longer than wide; arista with one dorsal and one ventral ray basal to terminal fork ..... (Marquesas) **Rosenwaldia** Malloch
   Eyes normal; arista with numerous dorsal rays and several ventral ones 6
6. With 4-5 pairs of dorsocentrals, 1-2 of them presutural; fore femora with a comb of short, stout spines on inner apical ⅓ or more ..... (Guam; Admiralty) **Chaetodrosophilella** Duda
   With 3 pairs of dorsocentrals, anterior pair at or close to the suture; no femoral comb ..... (Samoa) **Samoaia** Malloch
7. Arista furcate, the two branches about equal in length, the lower branch sometimes with a short preapical hair on upper side ..... (Marquesas) **Dicladochaeta** Malloch
   Arista plumose, pectinate or pubescent 8

8. Arista pubescent; prescutellars strong 9
Arista plumose or pectinate; prescutellars present or not 10

9. Mesonotum reddish-brown, without spots; costal index near 5.0; wings with dark pattern of spots on veins and in cells ..... (Hawaii) **Pseudiastata** Coquillett
Mesonotum with spotted pattern; costal index near 2.5; wings without complex pattern ..... (Hawaii; Australia) **Gitonides** Knab (*?=Cacoxenus* Loew)

10. Arista short pectinate dorsally, without ventral branches; pale bluish-gray pruinose species with enlarged bristles ..... (Hawaii) **Titanochaeta** Knab
Arista distinctly plumose 11

11. Entire frons highly polished or with a large glossy central triangle extending to anterior margin and only narrowly separated from the equally shining orbits; more or less metallic colored species 12
Not as above, the frons usually only slightly shining or dull, the triangle usually small; if metallic colored in part, then the front is not highly shining 13

12. Entire frons highly polished; fore femur without a comb of small spines on inner surface ..... (Samoa) **Lissocephala** Malloch
The shining frons and orbits separated by a narrow dull line on each side of triangle; fore femur with a comb on inner apical half or more ..... (Australia; ? Samoa) **Liodrosophila** Duda

13. Acrostichal hairs in 6 or more rows 14
Acrostichals in 2-4 rows 23

14. An extra crossvein present between 3rd and 4th veins near usual posterior crossvein; size up to 7.0 mm ..... (Hawaii) **Idiomyia** Grimshaw
Extra crossvein not present as described; size smaller 15

15. Acrostichals in 10 or more rows, often irregular; prescutellars strong 16
Acrostichals in 6-8 rows; no prescutellars or the hairs in this position only slightly enlarged 17

16. Costa reaching 3rd vein or slightly beyond; face flattened, not noticeably carinate; anterior reclinate orbital close to proclinate and closer to eye margin than the latter; 3rd costal section usually with small thorn-like warts on under side ..... (Australia; Fiji; Guam; New Zealand; Solomon) **Leucophenga** Mik
Costa reaching 4th vein; face somewhat carinate; anterior reclinate orbital well behind proclinate and usually in line with it and posterior reclinate; 3rd costal section without warts ..... (Australia) **Amiota** Loew

17. Anterior reclinate orbitals large, placed well anterior to the proclinates; postverticals small or minute; inner surface of fore femur of male with row of stout spines; often with fore femora, tibiae and metatarsi dark, the other legs and fore tarsi pale ..... (Hawaii) **Chymomyza** Czerny
Not entirely as above; anterior reclinate orbital usually smaller than other two or placed to the side of or behind proclinate or both; postverticals usually developed 18

18. Distal costal incision exceptionally deep, the lobe thus formed prominent and black, usually protruding beyond margin 19
Costal incision normal, the lobe sometimes dark but not protruding beyond wing margin 20

19. All three orbitals large and of about equal size; hind tibia with a distinct bristle about ⅓ from base on postero-dorsal surface; two pairs of subequal dorsocentrals; mostly pale yellowish species with darker markings ..... (Samoa) **Upolumyia** Malloch
Anterior reclinate orbital usually much smaller than other two; hind tibia without described bristly hair; often with only one pair of dorsocentrals; usually dark species or dark above and contrastingly pale below ..... (Australia; Marquesas; Samoa; Society) **Mycodrosophila** Oldenberg

20. Proboscis heavily chitinized, stout, straight and downwardly projecting, the apical section often as long as head height; central frontal triangle often distinct, large and subshining; oral margin indented medianly, the cheeks extended forward on either side; orbitals often in nearly a straight row and about equally separated at bases ..... (Samoa) **Zygothrica** Wiedemann
Not entirely as above; rarely with any of the above characters, never with all of them 21

21. Anterior dorsocentrals close to suture; basal scutellars half length apical ones: front twice as wide as long; anterior reclinate orbital microscopic; a single long, stout vibrissal pair; 3rd antennal segment densely pubescent..... (Samoa; Guam) **Hopkinsomyia** Malloch
(Almost certainly identical with *Microdrosophila* Malloch; Dr. Sturtevant has identified *M. congesta* from Guam.)
Not entirely as above..... 22

22. Lower angle of face with a conspicuous row of strong black bristles curved inwards in front of face; two strong dorsocentral pairs and 1-2 smaller bristles anterior to them; face not noticeably carinate; costal index about 3.5; posterior crossvein strongly inclined basally..... (Hawaii) **Hypenomyia** Grimshaw
Not entirely as above..... (all regions) **Drosophila** Fallén

23. Anterior dorsocentrals strong, at or close to suture; wings with three dark brown spots in marginal cell; crossveins clouded; arista with about 4 strong dorsal branches, none distinctly present below; genotype with extra veins in the dark spots between costa and 2nd vein; size about 1.5 mm..... (Hawaii) **Tantalia** Malloch
Not entirely as above..... 24

24. Distal costal incision exceptionally deep, the lobe thus formed protruding beyond wing margin and blackened; costal index near 1.0, the 2nd vein often bending rather abruptly to costa; anterior dorsocentrals close to suture; wings sometimes with complex pattern; arista usually with several dorsal and ventral branches; size up to 2.0 mm..... (Australia; Hawaii) **Dettopsomyia** Lamb
Not entirely as above..... 25

25. Face evenly and rather prominently convex below on its entire width, sloping gradually to epistome..... (Marquesas) **Bunostoma** Malloch
Face varying from almost flat to distinctly carinate, the carina separated from epistome by a distinct depression..... (Australia; Hawaii; Marquesas; Samoa) **Scaptomyza** Hardy

Alternate couplet 25: The above couplet 25 is the separation used by Malloch. In order to include an undescribed Hawaiian species in *Bunostoma,* where it seems to belong, the facial character must be considered as specific for *Bunostoma flavifacies* Malloch, the only included species.

The two genera would then be separable as follows:

25a. Anterior dorsocentrals placed close to suture; occiput somewhat pruinose when viewed from in front and above; arista with 2-3 ventral branches; proboscis slender and noticeably elongate; ocellar triangle distinct, shining, extending rather far anteriorly..... (Hawaii; Marquesas) **Bunostoma** Malloch
Anterior dorsocentrals (excluding any extra ones which may be present) well behind suture, usually closer to posterior pair than to each other; occiput not pruinose; arista with 1-2 lower branches; proboscis not noticeably elongate; usually rather long, slender species..... (Australia; Hawaii; Marquesas; Samoa) **Scaptomyza** Hardy

A new Species of Aedes from Tahiti (Diptera: Culicidae)

By ALAN STONE[1] and LEON ROSEN[2]

In the course of collecting mosquitoes in connection with filariasis studies on the island of Tahiti, French Oceania, S. A. Edgar and the junior author discovered the adults and larvae of an apparently undescribed, indigenous species of *Aedes,* which is herein described.

Aedes (Ochlerotatus) edgari, new species

Aedes sp. Marks, Occ. Papers Bernice P. Bishop Mus. 20:125, 1951.

Adult. ***Female.*** Wing 3.2 to 3.8 mm. in length. *Head.* Proboscis 1.4 length or front femur, black, the median third yellow-brown beneath, this color expanding upward distally and usually forming a complete ring around the proboscis at the anterior end of the pale area; labellae slightly paled. Palpus about one-seventh length of proboscis, black, with a few yellowish scales at apex. Clypeus dark brown, bare. Torus brown, without scales. Vertex brown centrally with recumbent hairlike golden and dark brown scales, and erect brown setae and scales; the golden scales mostly near the midline and along eye margin; opposite upper portion of anterior pronotum a patch of flat, pale yellow scales, below this a smaller patch of dark flat scales, and below this more flat yellow scales.

Thorax. Scutal integument dark reddish-brown; acrostichal and dorsocentral bristles present; scales hairlike, dark brown and golden yellow, the latter found mostly on the midline, dividing posteriorly, and usually as indistinct outlines to anterior and posterior oval sublateral areas of scutum. Scutellum on all lobes with only narrow golden scales. Anterior pronotum with dark setae and occasionally a few flattened pale scales; posterior pronotum shiny, dark, with scattered, closely appressed dark scales. Pleuron dark brown, shiny, the sutures paler; patches of semi-erect, broad, yellow scales on prealar area below knob, mid and ventral sternopleuron posteriorly, and mid mesepimeron; upper mesepimeron with a patch of rather slender setae; no lower mesepimeral setae; about 5 to 8 postspiracular setae. *Legs.* Fore coxa with a small patch of flat yellow scales anteriorly at base, dark scales below, and dark setae anteriorly; mid coxa with dark scales and a narrow patch of yellow scales medially, and dark setae laterally; hind coxa yellowish with yellowish setae posteriorly and no scales. Femora dark except for a narrow pale band at base of each and a stripe of pale scales tapering distally on posterior surface of each, that on the fore femur being dorsal in position, those on femora II and III ventral. Tibiae all dark. Fore and mid tarsi each with narrow white bands at bases of segments 1 and 2, and a trace on 3; hind tarsus with white basal bands on all segments, that on 1 about one-sixth of segment, on 2 about one-third segment, on 3 about two-fifths segment, on 4 nearly half segment, and on 5 all but a few dark scales at extreme apex. Claws equal, of fore and mid tarsi toothed, of hind tarsi simple. Wing scales slender, entirely dark. Halter yellow, the knob with dark scales.

Abdomen. Tergites black-scaled with patches of white scales at sides of segments 1 to 7; a few yellowish scales at bases of tergites 2 to 5, not forming distinct bands; hairs along hind margins of tergites yellowish. Sternites yellowish-brown with dark scales.

Male. Wing 3.2 mm. long. Largely similar to the female; however, differing as follows: White ring of proboscis complete, but much narrower ventrally. Palpus nearly as long as proboscis, the third and fourth segments with white bands basally; palpus turned down distally; long hairs at apex of third segment and on fourth segment ventrally; fifth segment with shorter hairs. Fore tarsus with claws unequal, the larger one toothed; mid tarsus with claws unequal, the smaller one toothed; hind tarsus with claws small, equal,

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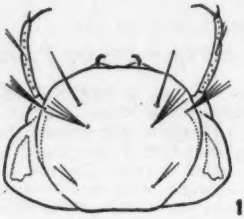
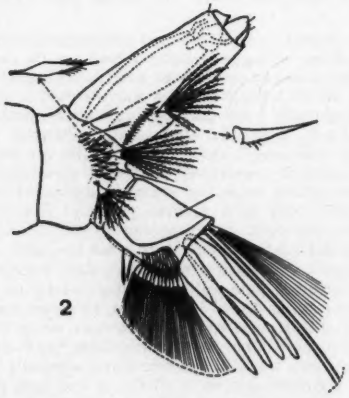
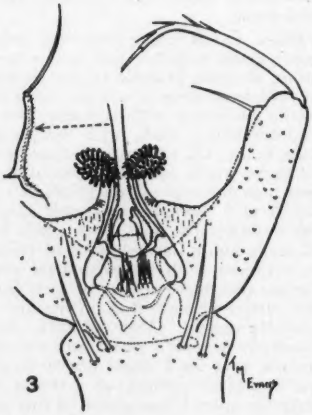
simple. Tergites 1 to 6 with distinct straight, white, basal bands, the lateral spots less developed; sternite 6 with a broad, pale band basally. *Genitalia* (Fig. 3). Eighth tergite with four heavy setae near posterior margin; basistyle about three times as long as basal width, with scattered long hairs dorsally and lateroventrally, and scales dorsally and laterally; shorter hairs ventrally; inner ventral (tergal) surface of basistyle with a large rounded lobe bearing scattered fine setae; from this lobe arises a bare arm, curving dorsally and then ventrally, at the end of which is an expanded knob bearing many stout, curved setae; apical lobe of basistyle weakly developed, with a single, inwardly directed, curved seta. Dististyle slender, curved, with a few hairs on apical fourth; apical appendage slender. Mesosome broad, membranous, truncate. Claspette stem slender, slightly curved, finely setose; blade slender, curved, about as long as stem; interbasal lobe with many fine hairs. Lobes of ninth tergite conical, with two or three bladelike setae, and several smaller ones. Tenth sternites rounded distally, each with a single subapical tooth and a few fine hairs near middle laterally.







Aedes (Ochlerotatus) edgari, n. sp. **Fig. 1.** Head of larva. **Fig. 2.** End of abdomen of larva. **Fig. 3.** Male genitalia. Drawn by Thomas M. Evans.

LARVA. *Head* (Fig. 2). Antenna with fine spinules; hair tuft, of 2 or 3 hairs, arising just before middle, not quite reaching apex of segment; largest terminal spine about three-fourths length of hair tuft. Preclypeal spine long, stout, curved. Preantennal hair (A) multiple; lower head hair (B) single or rarely double, long; upper head hair (C) 3 or 4 branched, slightly shorter. Mental plate triangular, about 17 teeth on each side, becoming progressively smaller toward apex.

Thorax. Integument smooth. Prothoracic hair O, a short, stout tuft; hairs 1-3 arising close together, but not on a plate, the posterior one simple, the other two double; hair

4 slender, triple; hairs 5-6 long, simple; hair 7 long, stout, triple; hair 8 slender, double; 9, 10, and 12 simple; 11 a very small tuft. Mesothoracic hairs 1-4 short multiple tufts.

Abdomen (Fig. 2). Pentad hairs 1 and 2 slender, double; 3 and 5 stout, of 9-10 hairs; 4 single. Comb a dense patch of elongate, pale spines, tapering basally and apically, the distal portion fringed. Siphon about twice as long as basal width; hair tuft arising about opposite penultimate pecten tooth, with about 12-14 finely feathered branches, the longest branch not quite reaching apex of siphon. Pecten of 13-16 teeth, the distal ones largest, each usually with 1-3 lateral teeth. Anal plate not ringing the segment. Ventral brush of about 16 tufts, the basal two not on barred area; dorsal hairs consisting of a multiple tuft and two longer, simple hairs; lateral hair single or double. Anal papillae 4, subequal, about 3.3 length of anal segment, slender, tapering.

Holotype, male, ex ground pool, Punaauia, Tahiti, Dec. 4, 1950 (Leon Rosen), with genitalia on slide. Paratypes, same data, 34 males and 30 females; Paea, Tahiti, Feb. 11, 1949 (W. A. Robinson), female; same locality, Mar. 21 to June 1, 1949 (S. A. Edgar), 20 females; Mataiea, Tahiti, July 11, 1950 (Bambridge & Teotea), 3 females, 1 male, associated with 3 larval and 4 pupal skins. Holotype and paratypes (U. S. N. M. No. 61305); paratypes, British Museum, Paris Museum, California Academy of Sciences, and South Pacific Commission, Noumea, New Caledonia.

The larva was described from 3 mounted on slides, taken in a ground pool, Aiurua Valley, Tahiti, Nov. 11, 1950 (B. S. Bambridge), and 10, unmounted, taken from a ground pool, Mataiea, Tahiti (B. S. Bambridge).

We take pleasure in naming the species after S. A. Edgar, of the Alabama Polytechnic Institute, who was one of the first to discover the species.

This species falls into Edwards' Group A of the subgenus *Ochlerotatus*. The male can be readily separated from all other described *Aedes* species by the unusual development of the basal lobe of the basistyle. The female most closely resembles that of *vigilax* (Skuse), but the thoracic pattern, the almost entirely dark abdomen, the unspeckled femora, and the more extensive white banding of the hind legs clearly distinguish it. The larva also resembles that of *vigilax,* but the siphon is longer in relation to its basal width, the pecten teeth are slightly stouter, the anal gills are much longer, the comb scales are more abundant and more tapering distally, and head hair C has more branches than in that species.

Biology. Larvae and pupae of this species have been found in five different temporary, shallow ground pools on the island of Tahiti. In each instance the aquatic forms were present in abundance and were of approximately the same stage of development. Specimens were found in association with *Culex quinquefasciatus* Say and *C. annulirostris* Skuse in one instance, and with *C. quinquefasciatus* alone in another. Only one generation of larvae of this species was found in four of these pools although water persisted in them and successive generations of the other mosquito species occurred. A second generation of the species occurred in one pool about one month after the first discovery, the pool having dried and been reflooded during this period. The pools were shaded in three instances and in the open sunlight in the other two. Larvae were found once in a pool near the sea, but the bottom of the pool was at

least 3 meters above sea level and there was little likelihood that the water was brackish.

Females have been observed feeding on man at night in nature.

Relation to Disease. The junior author has shown this species to be an efficient intermediate host of Tahitian strains of *Wuchereria bancrofti* in the laboratory. Its importance as a vector of filariasis in nature is not yet known.

Sphaeroceridae (Diptera) from Hawaii

By O. W. RICHARDS

I have recently been able to examine about one hundred flies of the family Sphaeroceridae, all collected in the Hawaiian Islands and sent to me by Dr. D. Elmo Hardy. I have also examined in the British Museum collection the specimens which were recorded by Grimshaw in the "Fauna Hawaiiensis" (3) [1]. There are no new species in this material and it is highly probable that all the species have been introduced. One, *Limosina aequalis* Grimshaw, is not yet known elsewhere but this means little in a group of small, inconspicuous flies. The species examined are recorded below.

COPROMYZA Fallén, 1810

Copromyza (Copromyza) equina Fallén, 1820.

Hawaii, Lake Waiau, near top of Maunakea, 13,007 ft., October, 1951, 2 males, 3 females. This is a cosmopolitan, but mainly Holarctic, species.[2]

Copromyza (Borborillus) sordida Zetterstedt, 1847.

Borborus bilineatus Grimshaw, 1901. New synonym.

Besides Grimshaw's specimens from Kona, Hawaii, 4,000 ft., July, 1892, which were really two males, not a male and female, the following have been seen: Hawaii, Waipio Bay, near Kukuihaele, August 14, 1949 (D. E. Hardy); Molokai, March 21, 1907, 3 males, 6 females (D. L. Van Dine).

This is another cosmopolitan species and the specimens seem to be identical with the ordinary European form.

LIMOSINA Macquart, 1835

Duda (2, p. 14) claims that *Leptocera* Olivier, 1813, was founded on a species of chloropid. In view of the uncertainty attaching to the name *Leptocera,* it is probably best to revert to the more familiar *Limosina.*

Limosina (Limosina) brevicostata Duda, 1918 var. **rufifrons** (Duda), 1925.

The variety was originally recorded from Abyssinia, Formosa and New Guinea. Hawaiian specimens are: Oahu, April, 1951, male, female, sweeping, female on window (D. E. Hardy).

Limosina (L.) puerula Rondani, 1880.

This species has been recorded from Europe and the Seychelles. From the Hawaiian Islands: Oahu, April, 1951, male, female, on window

[1] Figures in parentheses refer to the list of papers at the end of this article.

[2] This is a new specific island record. However, the earliest record for this species from the Hawaiian group is Wirth's in 1946 ("Proceedings" 13:22, 1947).

(D. E. Hardy). Both specimens have rather more orange markings than usual, including some suffusion of the thorax. There is a second female in bad condition, with the same data; it probably belongs to this species.

There is also a female *Limosina* (*sen.str.*), Oahu, Manoa Valley, March 28, 1951 (M. Adachi) which seems to belong to some species near *L. moesta* Villeneuve, 1917, but it is in bad condition.

Limosina (Poecilosomella) punctipennis (Wiedemann), 1830.
Limosina venalicia Osten-Sacken, of Grimshaw, 1901.

This species has been confused with *L. (P.) angulata* Thomson, 1868 which has R 2+3 much more sharply angled. All Grimshaw's specimens seem to belong to the present species, as do 14 males and 7 females sent by Dr. Hardy. It appears to be common, at least on Oahu, just as it is in most subtropical or tropical countries.

Limosina (Collinellula) downesi (Richards), 1944.

This species was originally obtained in large numbers in a ship in Glasgow, breeding in damp wheat from Argentina. The Hawaiian specimens are rather smaller but quite similar and have the same type of male genitalia. The curvature of R 4+5 varies somewhat and the specimen figured (4, fig. 2) has this vein straighter than usual. Normally, it is about as in *L. fuscipennis* Haliday, not more curved as stated in the original description. Specimens examined: Oahu, Ala Wai, Honolulu, April 16, 1950, near canal on weeds, male, 2 females (M. Adachi); Oahu, Hanauma Bay, March 27, 1950, 5 males, 5 females (M. Adachi); Oahu, Honolulu, February, 1951, on rocky beach, female (D. E. Hardy).

Limosina (Paracollinella) abdominiseta (Duda), 1925.

This species was described from Paraguay, Brazil, Bolivia and Chile. Although authentic specimens have not been seen, the Hawaiian flies agree perfectly with the original description. Oahu, Waianae, April 1951, male (D. E. Hardy); Oahu, Waimanalo, January 31, 1951, male, female, January 22, 1951, 3 males, 4 females (D. E. Hardy); Oahu, Honolulu, February, 1951, female, February 21, 1951, general sweeping, female (R. van den Bosch), April 21, 1951, male (K. Kutaka), May, 1951, at light, female (D. E. Hardy); Coconut Island (off Oahu), April 2, 1951, female (K. Kutaka).

Limosina (Opacifrons) aequalis Grimshaw, 1901.

This species was described from Oahu, Kawailoa Creek, April, 1893, male, female, and these specimens have been examined in the collection of the British Museum. In Duda's key (1, p. 67) it might run down to *L. parvicornis* Duda, 1918 because of its widely separated antennae, but it is larger, with dark tarsi, with the second costal sector longer than the third, and with the last tergal plates shining black and each with a stout, black, spike-like bristle. Compared with *L. maculifrons* Becker, 1907, which has similar venation, it has small silvery areas on the head, particularly between the orbits and the frontal triangle, the abdomen ends in two, not four, stout bristles, and it is a larger species (length 2.0 mm.). *Opacifrons rubrifrons* Vanschuytbroeck, 1950 and *O. ghesquiérei* Van-

schuytbroeck, differ in colour and both have the second costal sector shorter than the third.

Of the species described by Spuler (5) only *L. wheeleri* has the second costal sector longer than the third and the female without a preapical ventral bristle on the midtibia, but that species has four pairs of dorsocentral bristles and has R 4+5 much more sinuate.

The principal characters of *L. aequalis* are the following: a smaller but distinct outwardly directed bristle inside each of the two outwardly directed inferior orbitals; antennae strongly divergent, arista with moderately long pubescence, three times as long as third segment; two pairs of strong dorsocentrals and acrosticals, all minute; mid-femur in male with a weaker anteroventral and a stronger posteroventral comb-like row of about twelve short, stout bristles; mid-tibia in male with a small anterodorsal bristle at ¼, a pair of bristles at ¾, and a somewhat stronger anterodorsal bristle just below them, ventrally with very short, comb-like bristles on apical half, in female similar to male but ventral comb absent. Wings with second sector of costa distinctly longer than third, costa extending a very short distance beyond R 4+5 which is almost straight and ends rather nearer the wing-tip than does the fold-like extension of M 1+2; abdomen in female with no long bristles, last tergal plates strongly shining, each with a stout, spike-like bristle, in male with reflexed margins of tergites 3 and 4 with long, dense, hair-like bristles, genitalia rather large, with no long bristles, anal split rather widely oval, surrounded by close-set short bristles, genital forceps apparently short, fifth sternite asymmetrically emarginate, on left side with a projecting lobe bearing a comb of black bristles.

New record: Hawaii, Pauahi (8 miles east of Capt. Cook), August 12, 1949, 7 males, 6 females (D. E. Hardy).

Limosina (Coproica) ferruginata (Stenhammar), 1854.

This species breeds in manure and seems to have been carried to most parts of the world. I have seen one Hawaiian specimen: Oahu, Ft. Shafter, October 9, 1922, dairy, ex manure, male (J. F. Illingworth).

Limosina (C.) hirtula Rondani, 1880.

This species also is cosmopolitan and breeds in dung or in decaying vegetable matter. Specimens examined: Oahu, Honolulu, dead snails, April, 1951, male, two females (D. E. Hardy); bait trap, April, 1951, male (D. E. Hardy). January, 1951, female (D. E. Hardy).

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A new Nesosydne from Chenopodium on Hawaii (Hemiptera-Homoptera: Delphacidae)

By ELWOOD C. ZIMMERMAN

EXPERIMENT STATION, H.S.P.A.

In 1948 ("Insects of Hawaii," 4:137) a list of the 72 plants from which native Hawaiian Delphacidae had been collected was given, and it was stated that "It is probable that a careful search of other genera of endemic plants will reveal the presence of many new kinds of leafhoppers". We are now able to add another genus of plants to that list. Dr. O. H. Swezey has asked me to place on record a new species of the endemic genus *Nesosydne* which he reared from *Chenopodium oahuense*, and I am pleased to present the data herewith.

It is interesting that not one of the nearly 300 kinds of endemic leafhoppers listed in my "Insects of Hawaii" has ever been taken on this widespread Hawaiian plant. In fact, the name *Chenopodium* does not occur in my volume on the auchenorhynchous Homoptera.

This is the eighty-third species of this taxonomically difficult assemblage of native leafhoppers to be described, yet one wonders if half of the species have been discovered.

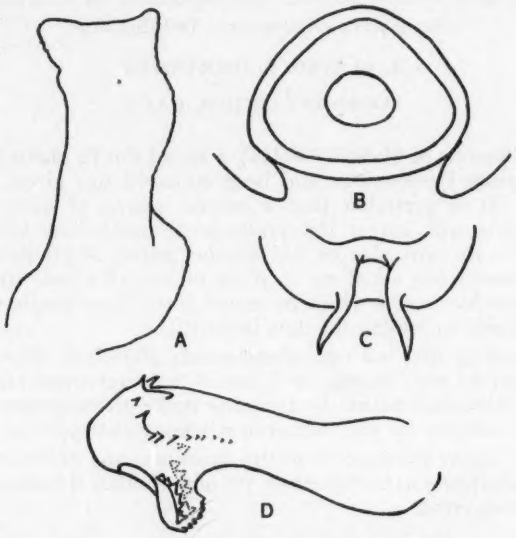
Nesosydne chenopodii, new species (figs. A-D).

Male. Brachypterous. Length from front of head to apex of tegmina: 2.0-2.1 mm. Color: evidently mostly green or greenish in life, mostly yellowish to greenish yellow after drying; nota of thorax either obscurely clouded and not prominently marked, or with dark areas, especially on metanotum; vertex usually with a fuscous spot on either side of base and a small, dark, median dot at the forking of the carinae which may lengthen forward into a fuscous streak to frons; frons almost concolorous, or with vague pale fuscous clouding between carinae, or with rather strong fuscous between carinae; clypeus with a pair of fuscous maculae at basal suture which may coalesce to form a dark transverse line demarking junction between clypeus and frons; legs with some vague pale fuscous clouding, but hind femora with a rather well-marked longitudinal fuscous stripe on outer sides, apical margins of hind femora and extreme base of hind tibia dark-spotted, major spines along apices of tibiae and tarsal segments and along calcar black-tipped, tarsal claws and apex of terminal tarsal segment black; tegmina hyaline, veins pale, granules on veins either all pale and obscure or some dark, the setae either all pale or some dark, a vague to well-defined dark macula may occur at apex of clavus and near point where first vein reaches apical part of costa (both of these maculae may be absent, or only the claval spot may be evident).

Head: vertex about three-fourths as broad across basal carina as median length, anterior profile moderately convex but carinae not protuberant, a line extended along basal carina passes just behind middles of eyes; frons three times as long as breadth at apex as measured between apices of facial carinae, top of frons, as seen from front, gently convex, median carina low, evidently forking above level of lower edges of eyes, forks not prominent and place of forking obscure; head viewed from side with distance between fore edge of an eye and lateral carina of frons subequal to distance between lateral carina and most remote point on profile of angle where frons rounds into vertex; antennae with first segment slightly less than one-half as long as second (measurements in one example: first segment 5.5 units long along top edge, 4 wide at apex; second

segment 12 long), combined length of first and second segments equal to distance from top edge of antennal scrobe to basal corner of clypeus.

Tegmina extending somewhat beyond apex of abdomen, nearly glass-clear to slightly milky-tinged.



Details of male genitalia of *Nesosydne chenopodii*, new species. **A,** left style; **B,** dorso-caudal view of anal segment to show protuberant anal angles of pygophore embracing anal segment; **C,** caudal view of lower margin of anal segment to show anal spines; **D,** aedeagus. A, C, D drawn from balsam mount; setae omitted.

Legs: hind femora hardly reaching apex of abdomen, length along dorsal edge subequal to length of a tarsus; hind tibia more than one-fifth longer than a hind tarsus (measured from extreme base to apex of apical spines of tibia); extreme length of first hind tarsal segment to apex of its apical spines fully one-fifth longer than extreme length of segments two plus three.

Pygophore comparatively small, compacted, height from bases of styles to dorsum slightly greater than extreme breadth, no protuberances on lateral or ventral edges; anal angles protuberant, rounded and curled inward to embrace anal segment so that a line drawn between apices of anal angles passes along or behind posterior margin of anal segment (as illustrated); spines of anal segment long, fang-like, curved conspicuously laterad, as viewed from behind, their bases distinctly separated (see figure); genital styles shaped as illustrated, presenting a rather broad view from behind; aedeagus as illustrated.

Female: brachypterous, quite like the male in general appearance; length from front of head to apex of tegmina: 2.5-2.75 mm.; length of tegmina: 2.0-2.5 mm., reaching to slightly behind apex of abdomen.

Pohakuloa (about 6,500 feet elevation), island of Hawaii.

Holotype male, allotype female (in the collection of the Experiment Station, Hawaiian Sugar Planters' Association), two male paratypes, three female paratypes and eight nymphs reared by Dr. O. H. Swezey

in September, 1951 from *Chenopodium oahuense* collected by C. J. Davis.

In my general key to the species of *Nesosydne* ("Insects of Hawaii" 4:175, 1948), this species will run to couplet 9 (8) which includes *chambersi,* and leads to *viridis* and *phyllostegiae,* but there are many obvious differences between these species, as a glance at the figures of the genitalia alone will show. In my key to the species from the island of Hawaii (same reference, page 198), it runs out at couplet 6 (5) and will not fit either alternate. This species appears to have nothing very distinctive which will make it stand out prominently among the other 82 species of *Nesosydne;* it is a rather commonplace species. The sum of its characters does, however, separate it quite well from any other species in the genus thus far discovered.

New Species and new Records of Elaterid Beetles from the Pacific—IV[1]

By R. H. VAN ZWALUWENBURG

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Through the courtesy of Hugh B. Leech and Dr. Edward S. Ross, the writer recently had the opportunity to examine a collection of Elateridae from the southwest Pacific, belonging to the California Academy of Sciences. In addition to new locality records, the collection contains four hitherto undescribed species, and one new variety. All type material has been returned to the California Academy of Sciences.

Compsolacon glirinus (Candèze)

Four specimens taken by A. J. Walz on Bougainville, Solomon Islands, were collected as follows: three at Piva, December, 1944 and May, 1945, a fourth at Empress Augusta Bay, June, 1945. This is a new record for this archipelago, the species having previously been known only from Fiji and from the New Hebrides.

Compsolacon gracilis (Candèze)

As noted in the third paper of this series (these PROCEEDINGS, 13:265) there occurs in the Marianas and on Moen in the Truk atoll, a form of *gracilis* which, if it is that species, certainly is atypical. The present collection contains six more specimens of this questionable *C. gracilis,* taken on Moen by R. W. L. Potts between February 3 and April 27, 1949.

Alaus guamensis, new species

Male, 16 mm. long; female, 19 mm. long.

Robust, moderately convex. Pubescence above and beneath uniform, ashy, without mottling, and (except for a faintly tawny area on either side of the disc of the pronotum) uniform in color.

Front broadly, triangularly impressed. Antennae black; short, attaining middle of prothorax (female) or somewhat beyond (male); segment 2 small, subglobular; 3-10 triangular, subequal; 11 longer than 10, constricted on apical one-third.

Prothorax longer than wide; sides subparallel on basal one-half (female), or for most of its length (male). Pronotum moderately convex; punctation on disc fine, close; hind angles wide, outcurved and divergent, strongly, bluntly unicarinate. Basal declivity moderate.

Scutellum declivous in single plane; heavily pubescent; longer than wide, widest just behind middle; apex broadly rounded.

Elytra at humeri about as wide as prothorax across hind angles. Sides subparallel to about middle (male) or beyond (female), thence conjointly narrowed to apex; apex of each wingcover deeply emarginate, both angles spinose, the outer one the longer. Third elytral interval anteriorly with short, moderately prominent ridge which posteriorly approaches the suture. Mucro subhorizontal; sides of mesosternal cavity horizontal, diverging anteriorly.

[1] The earlier papers with this title were published as follows: I, Bishop Museum Occ. Papers, vol. xvi, no. 5: 91-130, 6 figs., October 18, 1940; II, Proc. Hawaiian Ent. Soc., vol. 11, no. 3: 289-300, 3 figs., August, 1945; III, l.c., vol. 13, no. 2: 265-276, 6 figs., April 26, 1948.

Holotype (probable) female, Point Ritidian, Guam, August 9, 1945, G. E. Bohart and J. L. Gressitt colls., Naval Med. Research 2; allotype (probable) male, same data.

In this species no well-defined character (such as differences in the pubescence which clothes the last sternite) serves to separate the sexes. In the foregoing description the sexes were distinguished by differences in relative length and width of prothorax, and by the differences in outline of prothorax and of elytra found to be usual between male and female. The most striking feature of *Alaus guamensis* is the almost complete uniformity in the color of the pubescence. Due to abrasion there is a bare median line on the pronotum of the holotype.

Dioxypterus leveri Van Zwaluwenburg

One specimen: Bougainville, Solomon Islands, Naval Air Base, April, 1945, G. E. Bohart. This is a new island record for the Solomons.

Dioxypterus montrouzieri Fleutiaux

One specimen: Piva, Bougainville, Solomon Islands, December, 1944, A. J. Walz. This insect was described from the Solomons, but this is the first specific island record I have encountered.

Simodactylus risbeci Fleutiaux

A specimen taken by W. Bauer in May, 1943, on Espiritu Santo, New Hebrides, appears to be a new island record for this species, hitherto reported only from Ambrym and Pentecost islands in the same archipelago.

Simodactylus trukensis, new species

Males, 14.5-19.0 mm. long; females, 15.0-21.0 mm. long.

Elongate; dark reddish brown with head and pronotum sometimes piceous; pubescence short, fulvous.

Head usually widely concave on anterior one-third, with a distinct median impression behind the middle; front finely margined, acutely rounded on middle, especially in male; punctation close, moderately fine. Antennae elongate, reaching beyond middle of metasternum (female) or beyond middle of 2nd apparent abdominal sternite (male); segment 2 subglobular; 3-10 subtriangular with outer angle somewhat produced, the segments becoming progressively narrower and more rectangular as apex of antenna is approached; 3-10 (and sometimes 11 faintly) longitudinally carinate on outer face; 11 longer than 10, elongate-oval, acutely narrowed apically.

Prothorax of male slightly wider across base of hind angles than median length, sides converging from base of hind angles to anterior one-fifth; in male, measured at same points, the prothorax is about as long as wide, with sides subparallel from base of hind angles to about anterior one-sixth. Hind angles elongate, diverging from outline of sides, finely bicarinate. Disc of pronotum flattened with suggestion of median channel; punctation fine, close, somewhat coarser laterad; basal declivity short, abrupt.

Scutellum longer than wide; strongly narrowed apically.

Elytra at humeri slightly wider than width of prothorax across tips of hind angles; sides parallel to about middle (male) or beyond (female), thence conjointly narrowed to apex; wingcovers dehiscent at apex, tips finely spinose. Striae consisting of rather shallow, close-set punctures, intervals convex, more strongly so toward base. Mucro slightly upturned behind fore coxae; subapical tooth blunt. Sides of mesosternal cavity horizontal and strongly V-shaped on basal half; perpendicular anteriorly. Lobes of tarsal segments 3 and 4 weakly developed.

Holotype female, Moen Is., Truk atoll, Caroline Islands, Civil Administration Area, April 19, 1949, at light, R. W. L. Potts; allotype

male, same data, April 21, 1949. Paratypes as follows: 5 females, same locality, April 2 to 19, 1949, at light, R. W. L. Potts; 7 males, same locality, March 20 to April 21, 1949, R. W. L. Potts.

The elytra are unusually elongate for the genus, their length being about three times that of the head and thorax. The sides of the mesosternal cavity are horizontal posteriorly and perpendicularly precipitous anteriorly, in this respect resembling *Simodactylus prominens* Van Zwaluwenburg from Manus Island. However, *S. trukensis,* with its larger size, and particularly with its very long antennae, can hardly be mistaken for the other species.

Conoderus pallipes (Eschscholtz)

New island records for this widespread species are Espiritu Santo, New Hebrides, May 20, 1943, W. Bauer, and Guadalcanal, Solomon Islands, January, 1921 (Van Dyke collection).

Melanoxanthus cuneolus Schwarz

A new island record for this species comes from Tondano, in the northern Celebes. Two specimens from the Hadden collection in the California Academy of Sciences, collected by Van Braekel, April 1, 1932, are identical with a specimen from Brunei, Borneo, identified as *M. cuneolus* by the late Edmond Fleutiaux. The species was described from British North Borneo and Sumatra.

Melanoxanthus longicollis Fleutiaux **suturalis** new variety

The elytra of *M. longicollis* from Mindanao are described as yellowish with only the apex black. The present variety has more extensive black markings than typical individuals; these are disposed as follows:

(1) Almost the entire posterior one-half of the elytra black.
(2) Anterior half of elytra with black band along suture, from 2 to 3 intervals wide on each wingcover.
(3) Anterior half of elytra with black band of varying width along lateral margin.

Minor differences in outline of pronotum and in degree of truncation of the end of the elytra are apparent upon comparing the variety with females from the Philippines, but these are not considered of specific importance.

Described from a holotype female and an allotype male from Maffin Bay, Dutch New Guinea, May 25 and October 7, 1944, E. S. Ross coll.

Melanoxanthus luteus, new species

Length 4.7-5.2 mm.

Moderately robust; yellowish brown with vertex of head, pronotum (usually on anterior part of disc), greater part of elytra (except base), darker brown; antennae and legs light yellowish brown. Pubescence, fine, short, yellow.

Front of head flattened, with vague median prominence; anterior margin arcuate, prominent but not reflexed; punctation close, fairly coarse. Antennae short, slightly longer in male than in female; segment 3 slightly longer than 2, the two together subequal in length to 4.

Prothorax (measured along median lines) slightly longer than wide (male), or about as long as wide (female); sides rectilinearly narrowed forward from about basal one-third (male), or arcuately narrowed from about middle (female). Pronotum moderately convex; punctation uniform, dense, somewhat finer than on head; channelled on basal

declivity; hind angles diverging little, if at all, from outline of sides, strongly unicarinate, the carina close to lateral margin.

Scutellum flat, elongate, sides subparallel on basal one-half, acute at apex; anterior margin excavate.

Elytra as wide at humeri as prothorax; sides parallel to about middle (male), or beyond (female), thence conjointly narrowed to rounded apex. Striae consisting of well-impressed punctures; intervals flat.

Underside more or less uniformly yellowish brown, with prosternum and legs lighter. Mucro directed backward on same plane as rest of prosternum; sides of mesosternal cavity declivous.

Holotype female, Civil Administration Area, Moen Is., Truk atoll, Caroline Islands, April 27, 1949, R. W. L. Potts; allotype male, same data, March 7, 1949; 1 paratype female, same data, March 25, 1949, and 1 paratype male, same data, February 10, 1949.

This species possesses no very distinctive characters. The dark brown suffusion on the pronotum varies in extent, and in one individual attains the lateral margins.

Melanoxanthus melanocephalus (F.)

A specimen from Tahiti, Society Islands, July, 1916, collected by R. Topping provides the first record of this species from this archipelago.

Melanoxanthus subcylindricus Candèze

Dr. E. S. Ross took 14 specimens of this species at Maffin Bay, Dutch New Guinea, in September and October, 1944. New Guinea is a new locality record for this insect which until now has been recorded only from the Moluccas (Batchian is the type locality), the Aru Islands and Luzon. Dr. Ross's specimens differ from the description (Élatérides nouveaux, 1:35, 1865) and from a male from Luzon, identified by Edmond Fleutiaux, in having the hind angles of the pronotum rufous instead of concolorous with the rest of the pronotum. The New Guinea insects have the basal markings on the elytra larger and less circular than in the Philippine example, and the scutellum notably more tumid. The male genitalia of the specimens from the two localities are apparently identical.

Eschatroxus rossi, new species

7.5-8.0 mm. long; about 0.9-1.0 mm. wide.

Uniformly black above except as modified by pubescence. Pubescence generally erect and black; on pronotum, just before middle of lateral margin, and at right angles to it, a fascia of recumbent, golden yellow pubescence extends mediad about half-way to disc, then turns posteriad and continues almost to hind angles; vestiture on anterior and hind angles of pronotum gray; sutural line of elytra margined with gray hairs; a few gray hairs among the black on dorsal surface. Beneath, black except for anterior one-half, or more, of prosternum, which is vaguely rufous, and basal one-half, or more, of femora, which are yellowish red; pubescence on underside fine, gray, thickest on sides of abdomen.

Front finely margined, reflexed at sides, subtruncate on middle; anterior part of disc convex. Antennae robust, more or less attaining tips of hind prothoracic angles; segment 2 subglobular; 3 slightly shorter than 4 and following, but narrower; 4-10 subequal, broadly triangular, a little longer than wide; 11 suboval, about as long as 10.

Prothorax about as long as wide; sides subparallel to anterior one-fourth, thence arcuately narrowed to apex. Pronotum convex; punctation extremely fine; hind angles stout, slightly divergent, bluntly unicarinate; basal declivity moderate with a median channel which is deeper anteriorly than at bottom of declivity.

Scutellum elongate, tumid, sides subparallel; rounded at apex.

Elytra at humeri as wide as prothorax; sides parallel to beyond middle, thence conjointly narrowed to apex, which, on each wingcover is obliquely, shallowly emarginate; outer angle of emargination shorter and more acute than inner. Disc of elytra flattened; striae consisting of rows of well-impressed punctures; intervals moderately convex.

Described from a holotype, believed to be a male, and a probable male paratype, both from Maffin Bay, Dutch New Guinea, June, 1944, E. S. Ross coll.

This species is remarkable for its almost uniformly black upper surface, modified only by a small area of yellowish pubescence.

Melanotus guambatae Van Zwaluwenburg

A new archipelago and island record for this species is supplied by a specimen collected on Los Negros, Admiralty Islands, April, 1945, by G. E. Bohart.

Additions and Corrections to Bryan's Check List of the Hawaiian Diptera[1]

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(Presidential Address, delivered, in part, December 10, 1951)

R. C. L. Perkins made the first comprehensive collection of the Hawaiian flies and the dipterous portions of the "Fauna Hawaiiensis" were based largely upon material which he had collected. The "Fauna Hawaiiensis" (Grimshaw, 1901-1902; Speiser, 1902, and Perkins 1910, 1913) recorded one hundred ninety-two species from the Territory. These were arranged in twenty-seven families and apparently represented one hundred thirty-five endemic species and fifty-seven which had been introduced. Since that time the order was not reviewed until Bryan's excellent work (1934 "Proceedings"[2] 8:399-458). Except for the "Fauna Hawaiiensis" this is the most important contribution which has been made to the literature pertaining to the Hawaiian Diptera. It has proved an invaluable aid to the study of our flies. Bryan's check list contained three hundred twenty-nine species and one variety. At least fifteen of these were incorrectly recorded from the islands or are synonyms of other species in our fauna. Some of the others are synonyms of species not previously recognized from Hawaii and many of the names were based upon misidentifications. Bryan recorded forty-two families in his list.

Since Bryan's list, an additional one hundred sixty-two species and one subspecies have been recorded. In addition to these, sixty-plus species have been recorded, by genus only, as new records for the Territory, but at present specific names are not available for these. In view of this increase in the number of species known in our fauna, and the need for correction of so many of the names in our literature, it is desirable that the check list be brought up to date.

Our species are now arranged in forty-one families. Three new families have been added since Bryan's list. Three of his families are not present here and the names are being removed from the list. Two other families are being lumped together, in keeping with the practices of the specialists in the group.

The taxonomy of the Hawaiian Diptera is still in a somewhat preliminary state. We have considerable knowledge concerning some families but others are in a complete state of confusion, and careful revisional studies will be necessary in order to straighten out some of the groups.

[1] Published with the approval of the Director of the Hawaii Agricultural Experiment Station as Technical Paper No. 249

[2] "Proceedings" in this paper refers to the Proceedings of the Hawaiian Entomological Society.

We need much more information concerning the immature stages and biologies of our species. Dr. F. X. Williams made some remarkable contributions in this field; his biological studies of the aquatic flies are unexcelled. We still have very little knowledge concerning the overall phylogeny and evolutionary development of our Diptera fauna. Hawaii is an ideal spot in which to study insular evolution and speciation in various families of flies. This vast field still remains to be explored.

The family names which are used in this paper are the ones which are in most common current usage (especially in the United States) and which are more nearly correct according to a strict interpretation of the Rules of Zoological Nomenclature and the opinions handed down by the International Commission on Zoological Nomenclature. The advice and policies of the specialists at the United States National Museum have been followed in all controversial cases. Unfortunately, some of the names will undoubtedly be changed again. At the present time there is so much confusion with regard to the family names that the controversial issues can never be settled until direct action is taken by the International Commission. The Meigen 1800 names are now used very widely, in accordance with Opinion No. 28 of the Rules of Zoological Nomenclature which states "the generic names contained in Meigen's Nouvelle Classification, 1800, must take precedence over those in his Versuch, 1803, in every case where the former are found valid under the International Code." Many of the workers of the world have not accepted this decision and have ignored the 1800 names. Curtis W. Sabrosky of the U. S. National Museum has just written to me concerning a paper which he gave at the last International Congress at Amsterdam recommending suppression of the 1800 names. He says, "Although generally a believer in priority, the predominance and persistence of the 1803 names and the hopelessness of changing everyone over to 1800 in any reasonable future time, have led me to believe that the quickest and best chance for uniformity would be to suppress the 1800 paper for good and all before the matter drags out any longer." I heartily agree with Mr. Sabrosky's proposal. It is apparent that such action by the Commission would be the simplest way of achieving stability in our Diptera names. In the meantime, however, we still must contend with the 1800 names.

TIPULIDAE

(Change of name for Limoniidae, as used in our literature)

Erioptera (Meterioptera) bicornifer Alexander, 1921, Ann. Ent. Soc. Amer. 14:116.
Eastern Asia. Recorded from Honolulu by Alexander, 1941, "Proceedings" 11:24.

Limonia (Dicranomyia) casei Alexander, 1941, "Proceedings" 11:23.
Known from Oahu and Maui.

L. (Dicranomyia) haleakalae Alexander, 1951, Ann. Mag. Nat. Hist. ser. 12, 4 (42) :583.
Known only from Maui.

L. (Dicranomyia) kraussi Alexander, 1951, l.c.:583.
Known only from Maui.

L. (Dicranomyia) wainaensis Alexander, 1951, l.c.:586.

Known only from Oahu. The specific name is derived from Waianae and is misspelled. It should be emended to *waianaensis.*

CHANGES IN NAMES

Dr. Alexander says that *Trimicra* is now placed as a subgenus of *Erioptera.* The combination of names for our species of this group should be *Erioptera* (*Trimicra*) *pilipes* F.

Dr. Alexander reports that he has in manuscript a number of additional new species of *Limonia* (*Dicranomyia*) from Hawaii. Evidently there are still many undescribed species in our fauna.

PSYCHODIDAE

ADDITIONS TO BRYAN'S LIST

Psychoda pseudalternata Williams, 1946, "Proceedings" 12:637.

Australia and Oahu (probably general over the Hawaiian Islands). See note below.

P. phalaenoides (L.), 1758, Syst. Nat. ed. 10 (32) :588.

Cosmopolitan. First recorded from Hawaii by Wirth (1947, "Proceedings" 13:7) from Oahu.

P. cinerea Banks, 1894, Can. Ent. 26:331.

This is a new record for the islands based upon a series of specimens from a light trap on the University of Hawaii campus, Honolulu, January, 1951 (B. P. Defibaugh). These were determined by Larry Quate, University of Nebraska. The species was described from New York.

Trichomyia sp.?

First reported from Hawaii by Williams (1943, "Proceedings" 11:325) from Oahu.

Mr. Quate has recently submitted a tentative list of the Psychodidae which he studied from our collection. Besides the above mentioned *Psychoda cinerea* Banks and the previously known Hawaiian species, he lists the following:

Psychoda sp.? #1, from Oahu.
P. sp.? #2, from Oahu.
P. sp.? #3 (May be sp. #2 of Williams, 1943, "Proceedings" 11:337, from Oahu).
P. sp.? #4, from Oahu.

(Quate says *P. inornata* Grimshaw is probably one of the above numbered species.)

Trichomyia sp.? This is apparently the same species reported earlier by Williams. It is common at lights on Oahu.

NOTES

It is apparent that there are still several unrecorded species in our fauna. Dr. Williams (1943, "Proceedings" 11:324-325) has studied the biologies of some of our species.

Psychoda pseudalternata Williams, 1946, "Proceedings" 12:637.

According to Dr. Alan Stone, U. S. National Museum, *Psychoda pseudalternata* is a Williams species and the specimens he had before him when he figured the species (1943, "Proceedings" 11:336) constituted the type series. He selected a lectotype in 1946 definitely tying the identity of the species to a specimen from Canberra, Australia (in the Bishop Museum).

This species has been accredited to Tonnoir by some workers, although he did not actually describe the species. The name is a *nomen nudum* in our literature as of 1940 ("Proceedings" 10:370) when "Mr. Bryan exhibited specimens of *Psychoda pseudalternata*, a new species being described by Dr. A. L. Tonnoir from Australia." In 1943 ("Proceedings" 11:336), F. X. Williams published the following: *"Psychoda pseudalternata* (unpublished) (figures 35, 36 and 39 and text figure 6)." He gave no description of the species but figured the wing, genitalia, and larva. He used specimens which had been designated as paratypes by Tonnoir. Stone points out that "in accordance with Article 25c of the Code, a species is not valid unless it has a definite diagnosis of characters, which meant a verbal diagnosis, and not figures alone." So the name *pseudalternata* dates from 1946.

CULICIDAE

ADDITIONS TO BRYAN'S LIST

Toxorhynchites brevipalpis Theobald, 1901, Monog. Cul. 1:245. South Africa.

This species was introduced into Hawaii early in 1950 by the Territorial Board of Health (Bonnet, 1951, "Proceedings" 14:237) as part of the mosquito control program. To date this species has been released only in Manoa Valley, Waiahole, and Pupukea Gulch, Oahu. It has recently been recovered in Manoa Valley near the point of liberation (Bonnet, 1952, "Proceedings" 14:366).

CHANGES AND NOTES

Toxorhynchites inornatus (Walker)

This is a change of combination for *Megarhinus inornatus* Walker. This species was introduced in 1929, from New Britain, but did not become established here.

Dr. Alan Stone (1948, Proc. Ent. Soc. Wash. 50:161) has pointed out that the name *Megarhinus* Robineau-Desvoidy is preoccupied and that the next available name for this group of mosquitoes is *Toxorhynchites* Theobald.

TENDIPEDIDAE

(Change of name for Chironomidae)

ADDITIONAL RECORDS

Clunio brevis Stone and Wirth, 1947, Proc. Ent. Soc. Wash. 49 (8) :212-214. Known only from Oahu.

C. littoralis Stone and Wirth, 1947, Proc. Ent. Soc. Wash. 49 (8) :203-206. Known from Oahu, Hawaii, and Kauai.

C. vagans Stone and Wirth, 1947, Proc. Ent. Soc. Wash. 49 (8) :206-212. Known from Oahu, Hawaii, and Kauai.

Spaniotoma (Smittia) maculiventris Edwards, 1935, B. P. Bishop Mus. Bull. 114, Pac. Ent. Surv. 7:89. Marquesas Islands.

First recorded in Hawaii by Williams (1944, "Proceedings" 12:164) from Honolulu.

Telmatogeton fluviatilis Wirth, 1947, "Proceedings" 13:166-167.

From Oahu. This was Williams' *Telmatogeton* sp. No. 1 (in part) (1944, "Proceedings" 12:168).

T. hirtus Wirth, 1947, "Proceedings" 8:158-161.

Known only from Kauai. This was Williams' *Telmatogeton* sp. No. 2, 1944, "Proceedings" 12:169.

T. japonicus Tokunaga, 1933, Phil. Jour. Sci. 51:95.

From Japan. First recorded in Hawaii by Wirth (1947, "Proceedings" 13:174) from island of Hawaii.

T. williamsi Wirth, 1947, "Proceedings" 13:162-166.

From Oahu. This was Williams' *Telmatogeton* sp. No. 1 (in part) (1944, "Proceedings" 12:168).

Thalassomyia setosipennis Wirth, 1947, "Proceedings" 13:121-125.

From Hawaii and Kauai.

Chironomus sp.?.

A species not recorded before from Hawaii. Williams, 1945, "Proceedings" 12:228. Oahu.

C. sp.?.

An unrecorded species differing from *C. hawaiiensis* Grimshaw by having dusky wings and thinly plumose antennae. Williams, 1944, "Proceedings" 12:158. Molokai.

Corynoneura sp.

Recorded by Wirth, 1947, "Proceedings" 13:21, from Kokee, Kauai.

Metriocnemus spp.?

Two undetermined species, Williams, 1944, "Proceedings" 12:165. From Oahu. Wirth (1946, "Proceedings" 12:491) records a *Metriocnemis* which he says is probably the same as Williams' sp. No. 2.

Pentaneura sp.

Recorded by Wirth (1947, "Proceedings" 13:8) from Ewa, Oahu.

Polypedilum sp.

Recorded by Wirth (1947, "Proceedings" 13:9) from Ewa, Oahu.

Spaniotoma spp.
Three undetermined species which were unrecorded in our literature (Williams, 1944, "Proceedings" 12:165) all from Oahu.

Tanytarsus spp.
Two species, probably endemic (and undescribed), which have not been recorded in our literature (Wirth, 1946, "Proceedings" 12:491) from Oahu.

Tendipes spp.
Two undetermined species apparently new to Hawaii (Wirth, 1946, "Proceedings" 12:491, and Wirth, 1947, "Proceedings" 13:9) from Ewa, Oahu.

CHANGES AND CORRECTIONS

The genus *Charadromyia* Terry, as recorded in our literature, is a synonym of *Telmatogeton* Schiner (Edwards, 1928, Konowia 7:236).

Telmatogeton abnormis (Terry), 1913, "Proceedings" 2:295.
Correction for *Charadromyia abnormis* Terry.

T. pacificus Tokunaga, 1935, Mushi 8:15.
This is the species which Williams discussed as *T. pusillum* Edwards, 1944, "Proceedings" 12:166.

T. torrenticola (Terry), 1913, "Proceedings" 2:292.
Correction for *Charadromyia torrenticola* Terry.

HELEIDAE

(Change of name for Ceratopogonidae)

ADDITIONAL RECORDS

Dasyhelea calvescens Macfie, 1938, Proc. Zool. Soc. Lond. ser. B. Tax 7:157-158. From Oahu.
Wirth (1946, "Proceedings" 12:492) reported this species to be abundant on the rocks back of the shore at Hanauma Bay, Oahu, the type locality. Williams (1944, "Proceedings" 12:180) studied the biology of this species.

D. hawaiiensis Macfie, 1934, Stylops 3:133-134. From Oahu.
Wirth (l.c.) reported this species to be common throughout Oahu, "from Mt. Kaala to sea level." He also collected it at Hilo, Hawaii. Williams (l.c.:176-178) worked out the biology of this species.

Forcipomyia ingrami Carter, 1919, Ann. Trop. Med. and Parasit. 12:290.
Described from West Africa. It also occurs through the southwest Pacific, Malaya, and the West Indies. First recorded from Hawaii by Williams (1936, "Proceedings" 9:111) from Oahu and Hawaii. This species is attracted to lights in great numbers (during December and January) throughout Oahu and perhaps the other islands. Williams (1944, "Proceedings" 12:173-176) worked out the biology of this species.

The four species of Hawaiian Heleidae have been briefly discussed by Wirth (1946, "Proceedings" 12:492).

MYCETOPHILIDAE

(Fungivoridae of authors)

No additional records. There are probably several undescribed species in our fauna. To date just three species of *Platyura* have been discovered.

SCIARIDAE

(Lycoriidae of some authors)

NEW RECORDS

Sciara (Lycoriella) garretti Shaw, 1952, "Proceedings" 14:494.

S. (Lycoriella) hardyi Shaw, 1952, l.c., p. 493.

S. (Lycoriella) johannseni Shaw, 1952, l.c., p. 493.

S. (Lycoriella) laffooni Shaw, 1952, l.c., p. 494.

S. (Lycoriella) stonei Shaw, 1952, l.c., p. 495.

NOTES

Refer to paper on Hawaiian Sciaridae by Dr. F. R. Shaw, this issue of "Proceedings," pp. 491-496.

SCATOPSIDAE

ADDITIONS

Scatopse fuscipes Meigen, 1830, Syst. Beschr. 6:314. Cosmopolitan.

This species was first recorded in our literature in 1934 by Bryan ("Proceedings" 8:406) as *Rhegmoclema atrata* Say "captured in a parasite cage from California in 1915. It is not known to be established." *Rhegmoclema* has been placed in synonymy with *Scatopse* and *atrata* Say is a synonym of *fuscipes* Meigen. It is also very probably the species reported by Bridwell (1920, "Proceedings" 4:284) as a "Bibionid fly" probably belonging to *Scatopse*. The first definite record of *S. fuscipes* in Hawaii was by Wirth (1947, "Proceedings" 13:7).

S. fuscipes is very common on Oahu and probably the other Hawaiian Islands. It has been reported from the island of Hawaii.

ITONIDIDAE

(Change of name for Cecidomyiidae)

ADDITIONAL RECORDS

Diarthronomyia chrysanthemi Ahlberg, 1939, Ent. Tidskrift 60:274, 278.

This is a new name for *D. hypogaea* Felt, *nec* Loew. Known from the United States and Europe. First recorded in Hawaii by Look (1949, "Proceedings" 13:332 as *Diarthromyia*). It was found damaging the leaves and stems of chrysanthemums grown under glass at Hilo, Hawaii. It occa-

sionally causes severe damage to "mums" grown out of doors on Oahu (Hardy, 1950, "Proceedings" 14:19).

Parallelodiplosis cattleyae (Molliard), 1903, Marcellia 1:165 (*Cecidomyia*).

This midge has been intercepted at Honolulu a number of times in galls on the roots of *Cattleya* being imported. It is not known to be established here. See Fullaway, 1938, "Proceedings" 10:48, and Swezey, 1945, "Proceedings" 12:336.

Dicrodiplosis guatemalensis Felt, 1938, "Proceedings" 10:43.

This species was introduced into the pineapple fields on Oahu in 1935. It is predaceous on mealybugs. There is no record of its recovery.

CHANGES AND NOTES

The taxonomic status of the flower-infesting *Contarinia* in Hawaii has been much confused in the literature. Jensen (1946, "Proceedings" 12: 525-534) presents biological evidence which indicates that "the tomato-infesting midge, which was referred to in the literature as *Contarinia solani* (Rübsaamen) in earlier years and as *C. lycopersici* Felt during recent years, is the same species (*C. maculipennis* Felt) found infesting hibiscus" (and other hosts). His work indicates that both *C. lycopersici* Felt and *maculipennis* Felt are synonyms of *solani* (Rübsaamen). He states, however, that "the West Indies *lycopersici* has been recorded only from tomato while the species in Hawaii is now known to breed in several unrelated plants. This fact makes it inadvisable at present to relegate the name *maculipennis* to synonymy, since the possibility exists that the midge in the West Indies is biologically distinct from the midge in Hawaii despite the apparent absence of consistent morphological differences."

Barnes (1937, B. P. Bishop Mus. Occ. Papers 13 (6) :61-66) who had not had the opportunity of examining the blossom midge of Hawaii stated that the occurrence of *C. solani* in Hawaii was probably based upon an erroneous identification "and that the midge in question must be *C. lycopersici* Felt which is closely allied to *C. solani* but is distinct."

Dr. Barnes (Rothamsted Expt. Sta., England), in correspondence, stated "it is highly probable that these two species [*Contarinia lycopersici* Felt and *C. maculipennis* Felt] are synonymous, but I would prefer to list the Hawaiian hibiscus midge, with its wide host plant range, including tomato, as *D. maculipennis* Felt (1933) (? = *lycopersici* Felt, 1911), although I think there is no doubt that they are one and the same species.

"*Contarinia solani* (Rübsaamen) (1891) should not appear in the Hawaiian list as it is a distinct European species. The records of it from Hawaii are due to erroneous identification."

Contarinia sorghicola Coquillett is a correction of combination for *Diplosis* (*Contarinia*) *sorghicola* (Coquillett) (Felt, 1908, N. Y. State Mus. Bull. 124:393).

STRATIOMYIIDAE

NO ADDITIONAL RECORDS

CHANGES AND CORRECTIONS

Cephalochrysa hovas (Bigot).

Change of combination for *Microchrysa hovas* Bigot. Dr. M. T. James, Washington State College, in correspondence, says he considers *Cephalochrysa* a valid genus; *hovas* is the genotype.

Evaza javanensis de Meijere.

Described by de Meijere, not Meigen (as in our literature).

OMPHRALIDAE

(Change of name for Scenopinidae)

NO ADDITIONS OF KNOWN SPECIES (SEE NOTES)

NOTES AND CORRECTIONS

Omphrale (Scenopinus) fenestralis (L.).

Apparently does not occur in Hawaii. No specimens have been found in the collections and this record in our literature is an error.

Omphrale? sp. #1 ♀ ♀.

The species recorded in our literature on several occasions as *Scenopinus niger* Meigen (this is an error for *S. niger* Degeer) was very evidently not correctly identified. Grimshaw (1901, Fauna Haw. 3:11) said two female specimens at hand "agree tolerably well with European specimens of this species." I have received European specimens of *niger* from Dr. Willi Hennig (Deutsches Entomologisches Institut, Berlin) and have compared them carefully with specimens from Hawaii. Our species is obviously not *niger* although it does resemble it in some details. *S. niger* is the type of the genus *Archiscenopinus* Enderlein, which is recognized by the widely separated eyes of the males, with all of the ommatidia of equal size, by the swollen, club-shaped hind tibiae of the male and the brownish fumose wings of both sexes. Unfortunately, all of the specimens from Hawaii which I have found in the collections have been females. A series of specimens on hand from Oahu (one in the H.S.P.A. collection from Hawaii) may possibly be *Archiscenopinus*. They conform with *niger* in that they have fumose wings. If it is this genus, however, it represents an undescribed species. Our species differs from *A. niger* in that the wings are more smoky-gray fumose, not distinctly brownish; the small crossvein is situated at the outer two-thirds of the discal cell, not at the middle; the abdomen is scarcely longer than the thorax, not twice as long; the front is nearly four times longer than wide (at middle), not twice as long as wide; etc.

It is highly probable that our species belongs in the genus *Omphrale*, although having fumose wings is a very unusual character in this genus. Our species appears to be related to (possibly identical with) *O. papuana* Kröber from New Guinea and Formosa. Males will have to be found before it can be correctly placed.

Omphrale? sp. #2, ♀ ♀.

This is part of the complex which has been treated in our literature under the name *Scenopinus niger* Meigen (error for Degeer). All of the specimens in the collections are females. It is apparently an *Omphrale* but as with the species discussed above, even its generic status cannot be determined with certainty without a male specimen. This species is similar in many ways to species #1 discussed above. It differs as follows: the wings are hyaline, not smoky fumose; the front and middle tibiae are yellowish, tinged with brown, not entirely black; from a dorsal view the occiput protrudes above the eye margin, not completely hidden by the compound eyes as in species #1; the front (measured to the lower ocellus) is one and three-fourths longer than wide, not nearly four times longer than wide. The hind margin of the scutellum is entirely black, not pale. The shape of the head, general body shape, and the wing venation also differ in the two species.

In my "Revision of The North American Omphralidae" (1944, Jour. Kans. Ent. Soc. 17:42) our species will fit *Omphrale nubilipes* (Say). *O. nubilipes* is, however, an unknown species. It was described from Indiana; the type has been lost and to my knowledge the species has not subsequently been correctly identified. It is most unlikely that our species is *nubilipes.*

In Kröber's key to the Indo-Australian species (1937, Stett. Ent. Zeitsch. 98:225) our species fits near *O. opaca* (de Meijere) (from Sumatra) and *O. sinensis* Kröber (from China). Without males it is impossible to be sure of its identity.

This is the most common of our window flies in Hawaii (Oahu). One can usually find several specimens on the windows of our laboratory at the University every afternoon.

Lucidomphrale lucida (Becker), 1902, Mitt. Zool. Mus. Berl. 2:39 (*Scenopinus*).

Scenopinus lucidus Becker as recorded in our literature should be changed to *Lucidomphrale lucida* (Becker). Bryan (1934, 8[3]:447) was in error when he attributed this species to Kröber. Our species fits the description of *Lucidomphrale lucida* in all details except that Kröber (1937, Stett. Ent. Zeitschr. 98:223) stated that the first two antennal segments (of the female) are about twice as long as wide and somewhat club-shaped, a character which he had not seen in any other species of Omphralidae. In the specimens from Hawaii the first two antennal segments are broader than long and are not at all club-shaped. Specimens were sent to Dr. W. Hennig, Deutsches Entomologisches Institut, Berlin, for comparison with specimens in Becker's collection (Zoological Museum, University of Berlin). Dr. Hennig replied that no specimens of *L. lucida* are present in the collections in Berlin. He said that Becker's type has been completely destroyed by *Anthrenus* and only the minuten nadeln and the labels remain.

A male and a female from Elisabethville, Belgian Congo, have been received for study from Monsieur Basilewsky of the Musée du Congo Belge. Our specimens agree in all details with those from Africa. Unfor-

tunately, the antennae are broken off the female specimen so Kröber's antennal character could not be checked.

The females of the species are rather common on windows on Oahu. I have taken but one male specimen on windows. I have found the males hovering just in one spot at Hanauma Bay, Oahu. I have checked several times and have found them only in one local area. Other collectors have taken them in various localities on Oahu.

EMPIDIDAE

This is a new family for Hawaii since Bryan's list.

Chersodromia hawaiiensis Melander, 1938, "Proceedings" 10:57.

Described from Hanauma Bay, Oahu. This species is associated with crab holes on the beach. It was first reported by Williams (1937, "Proceedings" 9:364) as *Chersodromia* sp.?

Drapetis insularis Melander, 1952, "Proceedings" 14:419.

This species has been very recently discovered (November 1951) flying over compost at the University of Hawaii dairy farm by H. A. Bess, D. E. Hardy, and Marian Adachi. The species is very abundant around the dairy farm, flying in association with swarms of *Milichiella lacteipennis.*

DOLICHOPODIDAE

ADDITIONAL RECORDS

Asyndetus carcinophilus Parent, 1937, Bull. et Ann. de la Soc. Ent. de Belg. 77:132-133.
Described from Oahu, associated with crab holes.

Campsicnemus acuticornis Parent, 1939, "Proceedings" 10:225.
From Oahu.

C. bicoloripes Parent, 1938, Konowia 16:73-75.
From Oahu.

C. breviciliatus Parent, 1939, "Proceedings" 10:225-226.
From Oahu.

C. contortus Parent, 1938, Konowia 16:75-76.
From Molokai.

C. deficiens Parent, 1939, "Proceedings" 10:226.
From Oahu.

C. depauperatus Parent, l.c.:226.
From Oahu.

C. ferrugineus Parent, 1934, Mem. de la Soc. Nat. des Sci. et Math. de Cherbourg 41:298.
From the island of Hawaii.

C. flexuosus Parent, l.c.:226-227.
From Oahu.

C. fragilis Parent, l.c.:227.
From Oahu.

C. fumipennis Parent, 1938, Konowia 16:76-77.
From Molokai and Oahu.

C. furax Parent, 1939, "Proceedings" 10:228-229.
From Oahu.

C. longiciliatus Parent, l.c.:229.
From Oahu.

C. maculus Parent, l.c.:229-230 (*C. macula*).
From Oahu.

C. membranilobus Parent, l.c.:230.
From Oahu.

C. miser Parent, l.c.:230-231.
From Oahu.

C. nigroanalis Parent, l.c.:231.
From Oahu.

C. obscurus Parent, 1938, Konowia 16:78-79.
From Molokai.

C. olympicola Parent, l.c.:231-232.
From Oahu.

C. pallidus Parent, l.c.: 232.
From Oahu.

C. penicillatus Parent, 1934, Mem. de la Soc. Nat. des Sci. et Math. de Cherbourg 41:300.
"Sandwich Is."

C. planitibia Parent, l.c.:232-233.
From Oahu.

C. putillus Parent, 1938, Konowia 16:80-81.
From Molokai.

C. ridiculus Parent, 1938, Konowia 16:81-82.
From Molokai.

C. simplicipes Parent, 1938, Konowia 16:82-83.
From Molokai. This is keyed out as a new species in Parent, 1939, "Proceedings" 12:240. This was an oversight.

C. tarsiciliatus Parent, l.c.:233.
From Oahu.

C. vafellus Parent, l.c.:233-234.
From Oahu.

Chrysotus elegans Parent, 1938, Konowia 16:68-69.
From Oahu. This is a synonym of *C. pallidipalpus* Van Duzee (Parent, 1939, "Proceedings" 10:248).

Cymatopus acrosticalis Parent, 1938, Konowia 16:69-70.
From Molokai, Oahu, and Maui.

Emperoptera haleakalaae Zimmerman, 1938, "Proceedings" 10:146-148.
From Maui.

Eurynogaster apicenigra Parent, 1939, "Proceedings" 10:240-241.
From Oahu.

E. binodata Parent, l.c.:241.
From Oahu.

E. cilifemorata Parent, l.c.:241.
From Oahu.

E. luteihalterata Parent, l.c.:242.
From Oahu.

E. maculata Parent, l.c.:242.
From Oahu.

E. minor (Parent), 1938, Konowia 16 (3-4) :213.
From Oahu. This was described as *Paraliancalus.*

E. nigrohalterata Parent, 1939, "Proceedings" 10:243-244.
From Oahu.

E. obscurifacies Parent, l.c.:244.
From Oahu.

E. retrociliata Parent, l.c.:244-246.
From Oahu.

E. viridifacies Parent, 1938, Konowia 16:209-211.
From Oahu.

Hydrophorus williamsi Parent, 1938, Konowia 16:211-212.
From the island of Hawaii.

Pachyurus hawaiiensis Parent, 1934, Mem. de la Soc. Nat. des Sci. et Math. de Cherbourg 41:305.
From Kauai.

Sigmatineurum chalybeum Parent, 1938, Konowia 16:216-218.
From Molokai.

CHANGES OF NAMES

Campsicnemus patellifer Grimshaw.
Parent (1939, "Proceedings" 10:232) says *C. nudifermoratus* Van Duzee is a synonym of this species.

Chrysotus pallidipalpus Van Duzee.
C. elegans Parent is a synonym (Parent, 1939, "Proceedings" 10:248).

Eurynogaster albifacies (Van Duzee) (1933, "Proceedings" 8:346).
Change of combination for *Sweziella albifacies* Van Duzee. *Sweziella* is a synonym of *Eurynogaster* (Parent, 1939, "Proceedings" 10:249).

Eurynogaster minor (Parent) (1938, Konowia 16:213).
Change of combination for *Paraliancalus minor* Parent (Parent, 1939, "Proceedings" 10:243).

Paraliancalus metallicus (Grimshaw) (1901, Fauna Haw. 3[1]:13).
Change of combination for *Liancalus metallicus* Grimshaw (Parent, 1938, Konowia 16:214).

Dolichopus stigmatifer Parent, 1939, Konowia 16:67.
Synonym of *D. exsul* Aldrich (Parent, 1939, "Proceedings" 10:249).

Medetera femoralis Becker.
Listed by Bryan (1931, "Proceedings" 7:401, and 1934, "Proceedings" 8:449, no locality given). The species was not listed by Van Duzee in his

discussion of this genus in Hawaii (1933, "Proceedings" 8:343-345). The species was described from New Guinea and has been recorded from Fiji. It probably does not occur in Hawaii.

NOTES

The family Dolichopodidae contains the greatest number of (known) species of all the families of Diptera in Hawaii. It is extremely well developed in our endemic fauna and it is obvious that much more work needs to be done on this group. The great majority of our species are known only from Oahu and it is very probable that our list could be doubled or tripled by concerted collecting of these flies on the other islands. To date ninety-two (possibly ninety-three; there is a question as to whether or not *Medetera femoralis* Becker occurs in Hawaii) species have been recorded from Hawaii. Sixty-five of these are known from the island of Oahu, while only four species have been definitely recorded from Kauai, and four or five from Maui. The following shows the known distribution of the species in the various genera.

Asyndetus	1 species, from Oahu.
Campsicnemus	36 species, from Oahu only.
	1 species from Oahu and Molokai.
	9 species from Hawaii.
	6 species from Molokai only.
	1 species from Kauai.
	1 recorded as "Sandwich Id."
	54
Chrysosoma	1 species, generally distributed.
	1 species, from Oahu.
	2
Chrysotus	4 species from Oahu.
	1 species from Maui.
	1 species from Hawaii.
	6
Cymatopus	1 species from Oahu, Maui, and Molokai.
Dolichopus	1 species, generally distributed.
Emperoptera	1 species from Oahu.
	1 species from Maui.
	2
Eurynogaster	13 species from Oahu.
	1 species from Hawaii.
	14
Hydrophorus	1 species from Hawaii.
	1 species from Oahu, Kauai, and Laysan Island.
	2

Medetera	2 species from Oahu.
	1 species from Hawaii.
	1? species, distribution not known.
	4
Pachyurus	1 species from Kauai.
Paraliancalus	1 species from Molokai, Maui, and Kauai.
Paraphrosylus	1 species from Oahu, Nihoa, Necker, French Frigate Shoal, Lisiansky and Wake.
Sciapus	1 species probably generally distributed.
Sigmatineurum	1 species from Molokai.
Syntormon	1 species from Oahu and Hawaii.
Total	93

Dr. Williams' biological studies of the Hawaiian Dolichopodidae (1939, "Proceedings" 10:288-315) is an outstanding contribution to the literature.

PHORIDAE

ADDITIONS TO BRYAN'S LIST

Megaselia biformis Brues, 1942, "Proceedings" 11:155-156.
Reared from *Achatina fulica* (giant African snail), from Oahu.

As was reported in the minutes of the May 14, 1951 meeting, a number of new records were received in the tentative report submitted by Father Thomaz Borgmeier, Rio de Janeiro, Brazil. They are as follows:

Diploneura *s. str.* sp.? (see below).
From Tantalus, Oahu.

Megaselia sp. #1.
From Honolulu, Oahu, "reared from *Thecla echion,*" June 1941 (D. D. Jensen), and in house, January 1951 (D. E. Hardy).

M. sp. #2.
From Honolulu, Oahu.

M. sp. #3.
From Honolulu, Oahu.

Chonocephalus sp. #1.
From Waimanalo, Oahu, in bait trap, January 1951 (Paul Gow).

C. sp. #2.
From Honolulu, Oahu, December 1950 (D. E. Hardy).

Puliciphora sp.
Honolulu, Oahu, November-December 1950 (Edgar Dresner).

In a recent letter, Borgmeier stated that while in Europe, he and Father Schmitz studied our *Diploneura*. "It is *Diploneura* (*s. str.*) *peregrina* (Wiedemann). [1830, Aussereurop. Zweifl. Ins. 2:600 (*Trineura*). Oriental]." Borgmeier also stated that *Diploneura setitibia* Malloch is a synonym of *peregrina*. The species has been seen from Mt. Tantalus, Oahu (O. H. Swezey), and Tantalus, April 1951 (D. E. Hardy), and Honolulu,

light trap, May 1951 (D. E. Hardy). It is interesting to note that most members of this genus are associated with ants.

CHANGES AND CORRECTIONS

Megaselia scalaris Loew.

Change of combination for *Aphiochaeta scalaris* (Loew). According to Borgmeier (letter), *Aphiochaeta xanthina* Speiser is a synonym of *M. scalaris* Loew. This synonymy has not been previously recorded in our literature.

Megaselia setaria (Malloch).

Change of combination for *Aphiochaeta setaria* Malloch.

MUSCIDORIDAE
(Change of name for Lonchopteridae)

NO NEW RECORDS

CHANGES AND NOTES

Muscidora furcata (Fallén), new combination (for Hawaiian literature).

Our species has been referred to in the literature as *Lonchoptera furcata*? It is now quite apparent that the *Muscidora* which has become established here is actually *furcata* (Fallén). I have made careful comparisons of specimens from Hawaii with *furcata* specimens from Europe, and with *dubia* Curran (quite obviously a synonym of *furcata*) specimens from various parts of the United States and have been unable to find differences which could be considered specific. Specimens were sent to Dr. W. W. Wirth, U. S. National Museum, for comparison and he was unable to distinguish any differences in the North American, Hawaiian, and European series. Two specimens were sent to Dr. W. Hennig, Deutsches Entomologisches Institut, Berlin, for comparison. He writes back that he cannot be sure that our material from Hawaii is *furcata*. He said, "Die Posterodorsalborste der T2 [middle tibiae] steht bei dem Tier aus Hawaii ein wenig höher als die obere Anterodorsalborste [it is obvious that he meant to refer to the upper dorsal bristle rather than the upper anterior dorsal bristle], während sie bei allen europäischen Exemplaren in unserer Sammlung in genau gleicher Höhe oder sogar etwas tiefer steht." Unfortunately, this character does not seem to hold for our specimens and I cannot separate them from the European specimens. Specimens were also sent to Dr. Martin Aczel, Fundacion Miguel Lillo, Tucuman, Argentina (Aczel is perhaps the best qualified worker on this group in the world). Aczel has replied that our specimens "belong undoubtedly to the species *Muscidora furcata* (Fallén), which is the only parthenogenetic species known in the Diptera." Aczel's last statement is of particular interest since to date only female specimens have been taken in the Territory. I have seen male specimens of this species from Europe. I have discussed this with Aczel and he has replied that he does not think that *Muscidora furcata* may be bisexual in some areas. He says the males have been taken rarely

in Europe but that they are imperfect and sterile, "representing only a form of atavism for the parthenogenetic species."

DORILAIDAE

(Change of name for Pipunculidae)

NO NEW RECORDS

NOTES

These interesting parasitic flies have not been studied in Hawaii since Perkins described four additional new species in his supplement to the "Fauna Hawaiiensis," 1910. To date twelve species have been described from the Territory under the genus *Pipunculus*. These all belong under the combination *Dorilas* (*Dorilas*). *Pipunculus rotundipennis* Grimshaw has been listed in the genus *Tömösváryella* by Aczel (1948, de Acta Zool. Lilloana 6:29), and from the original description and figure it would certainly appear to be a *Tömösváryella*. E. C. Zimmerman recently studied Grimshaw's type in the British Museum collection, and supplied enough information on the specimen so that we can now be sure it belongs in *Dorilas* (*Dorilas*). I will report on this in more detail when I complete my study of the Hawaiian Dorilaidae.

From my preliminary studies of this family in Hawaii, it is obvious that a number of undescribed species are present in our collections. I hope to have a monographic study of these completed in time for the next "Proceedings."

SYRPHIDAE

ADDITIONAL RECORDS

Allograpta exotica (Wiedemann), 1830, Ausser. Zweifl. Ins. 3:136.

Known from California, Central America, Ecuador, and Uruguay. First reported from Hawaii by Weber (1948, "Proceedings" 13:219) from Molokai and Oahu.

Eumerus aurifrons (Wiedemann), 1824, Anal. Entomol. 32:46. Oriental region.

First reported in Hawaii as *Eumerus* sp.? by Swezey (1934, "Proceedings" 8:361) from Oahu. Reported as *E. aurifrons* (Wiedemann), determined by Smart, in 1937 ("Proceedings" 9:366). This species has been recorded only from Oahu and Lanai.

Melanostoma sp.?

Manoa Valley, Oahu, December 17, 1950, reared from puparium on celery (O. H. Swezey). This species probably is not established in Hawaii. The celery had been shipped in from California.

Syritta orientalis Macquart, 1842, Dipt. Exot. 2:76.

Oriental region. First reported in the Territory by Weber (1949, "Proceedings" 13:332) from Oahu.

Volucella dracaena Curran, 1947, Amer. Mus. Nov. 1361:2-3.

Known only from Oahu.

V. hoya Curran, 1947, Amer. Mus. Nov. 1361:1-2.

Described from Oahu, and Lower California. Recorded from Kauai by Weber (1952, "Proceedings" 14:358).

Volucella sp.? rel. to **hoya** Curran.

Distinguished by the characters given in the key below. One female specimen has been seen to date. Taken on a window, University of Hawaii, Honolulu, September 1951 (D. E. Hardy).

CORRECTIONS AND NOTES

Volucella (Ornidia) obesa (F.).

Correct subgenus combination for *Volucella obesa* (F.) (Curran, 1947, Amer. Mus. Nov. 1361:1, and Hull, 1949, Trans. Zool. Soc. 26 (4) :348).

Tubifera Meigen (1800) has priority over *Eristalis* Latreille (1804). *Eristalis tenax* (L.) as recorded in our literature should be listed under the name *Tubifera.*

Lathyrophthalmus is placed as a subgenus of *Eristalis* by Hull (1949, Trans. Zool. Soc. 26[4]:396). The species which are in our literature as *L. aeneus* (Scopoli) and *L. arvorum* (F.) should be treated under the combination *Tubifera* (*Lathyrophthalmus*).

In Curran's paper titled, "New species of *Volucella* from Hawaii and the United States," (1947, Amer. Mus. Nov. 1361:1-6) he presents a key to "the volucelline flies so far known to occur in Hawaii." Unfortunately, he neglected to include our commonest, best known species, *Volucella pusilla* (Macquart). The following revision of Curran's key includes *pusilla* and the above mentioned undetermined species:

1. Face with lateral swellings; large species, 10.5-12 mm. in length; bright metallic green, blue or violaceous in color.....**Volucella (Ornidia) obesa** (F).
   Face without lateral swellings; smaller species 6.5-7.5 mm.; not brightly metallic as above 2
2. Wings with three brown, transverse, markings, otherwise hyaline; face with a broad brown lateral stripe on each side and with a brown median stripe; pleura entirely black, except for the bright yellow propleura.....**pusilla** (Macquart)
   Wings evenly yellowish fumose, slightly darker along veins but without brown markings; face with sometimes narrow, pale brownish, lateral stripes and no median stripe; upper half of pleura chiefly yellow..... 3
3. Scutellum with lateral depressions almost as long as wide, femora black on basal third or more..... 4
   Scutellum with weak transverse lateral depressions; femora all reddish..... .....**dracaena** Curran
4. Predominantly sub-metallic blue-black species; coxae and femora all black, except for slightly rufous-tinged extreme apices of the latter; humeri black and mesopleura discolored with black on the upper portion; mesonotum entirely blue-black except for yellowish markings on the sides; scutellum all blue-black except for a faint tinge of rufous at the base of the apical depressed area; abdomen blue-black, except for rufous markings in the middle of the first tergum and at the base of the second.....**sp.?**
   Yellowish species, with brown and ferrugineous markings; coxae yellow, femora yellow on apical halves; humeri and all of upper half of pleura yellow; mesonotum yellow with three brownish to blackish longitudinal vittae; scutellum with a large reddish spot in the middle; abdomen rusty red with black fasciae extending across terga two to four.....**hoya** Curran

Eumerus marginatus Grimshaw, although described from Hawaii (1902) is very probably an oriental species. It occasionally causes damage to bulbous plants in the Territory, although it appears to be attracted to bulbs or tubers that are diseased or that have been damaged mechanically. It has been reported infesting the following plants in Hawaii: Cassava roots (*Manihot utilissima* Pohl), lily bulbs and ginger roots.

Eumerus aurifrons (Wiedemann) is readily distinguished from *marginatus* by its white hind tarsi.

Note: The arrangement of the families has been changed from Bryan at this point to treat the Acalyptratae before the Calyptratae.

LAUXANIIDAE

(Change of name for Sapromyzidae)

The family name Lauxaniidae has preference over Sapromyzidae on both principles — of the oldest family name (1835 vs. 1840), or of the oldest included genus (1804 vs. 1820).

ADDITIONAL RECORDS

Homoneura unguiculata (Kertész), 1913, Ann. Mus. Nat. Hung. 11:100 (*Lauxania*).

Described from Formosa. First reported from Hawaii by Hardy (1952, "Proceedings" 14:346). The species had been identified in the Bishop Museum collection by Malloch, but the record was not put into our literature. This is a common species in the Territory. Specimens have been seen (some date back to 1922) from Hawaii, Oahu, and Kauai. This is probably the species referred to by Malloch (1929, Ins. Samoa 6[4]:208) as "a second species of *Homoneura* from Hawaii," but he did not name it.

CORRECTIONS

Homoneura hawaiiensis (Grimshaw).

Correction for *H. hawaiiensis* Malloch. See note below under family Tetanoceridae.

TETANOCERIDAE

(Change of name for Sciomyzidae)

Sciomyza hawaiiensis Grimshaw.

This is a *Homoneura* and belongs in the family Lauxaniidae. There are apparently no Tetanoceridae in the Hawaiian fauna (Hardy, 1950, "Proceedings" 14:73).

SPHAEROCERIDAE

(Change of name for Borboridae, see note below)

ADDITIONAL RECORDS

Copromyza (Copromyza) equina Fallén, 1820, Heteromyzides, 6.

Nearly cosmopolitan. First reported in Hawaii by Wirth (1947, "Proceedings" 13:22). A series of specimens, identified as *C. equina* by Dr.

O. W. Richards, was collected at Lake Waiau, Maunakea, Hawaii, elev. 13,007 ft., October 1951 (Edgar Dresner). This is an unusual distribution record for the species.

Limosina (Paracollinella) abdominiseta (Duda), 1925, Arch. Naturg. 90A, Heft 11 (1924):52 (*Leptocera*).

A new record for Hawaii, determined by Dr. Richards. See Richards, this issue of "Proceedings," p. 430, for distribution records.

L. (Limosina) brevicostata Duda var. **rufifrons** (Duda), 1925, *loc. cit.*: 188.

New record for Hawaii, determined by Dr. Richards, Honolulu, April 1951 (D. E. Hardy).

L. (Collinellula) downesi (Richards), 1944, Proc. Roy. Ent. Soc. Lond. 13A:167.

New record for Hawaii, determined by Dr. Richards. See Richards, p. 430.

L. (Coproica) hirtula Rondani, 1880, Bull. Soc. Ent. Ital. 12:24 and 40.

New record for Hawaii, determined by Dr. Richards. See Richards, p. 431.

L. (Limosina) puerula Rondani, 1880, *loc. cit.*:23 and 36.

New record for Hawaii, determined by Dr. Richards. See Richards, p. 429.

The new records of *Limosina* are all from the island of Oahu.

NOTES AND CORRECTIONS

Dr. O. W. Richards, Imperial College, London, has kindly brought the list of the Hawaiian Sphaeroceridae up to date. Of the four species listed by Bryan, *Limosina aequalis* Grimshaw is the only one which was correctly named. Ten species are now known from the Territory.

Copromyza (Borborillus) sordida Zetterstedt, 1847, Dipt. Scand. (Lund), 6:2484 (= *Borborus bilineatus* [Grimshaw]).

New synonymy reported by Dr. Richards, p. 429.

Limosina (Coproica) ferruginata (Stenhammar), 1854, Copromyzinae Scandinaviae, p. 397 (*Leptocera*).

A correction of combination of *Leptocera ferruginata* according to Dr. Richards.

Limosina (Poecilosomella) punctipennis (Wiedemann), 1830.

This is a correction of *L. venalicia* Osten Sacken, of Grimshaw, 1901. See Richards, p. 430.

Limosina (Opacifrons) aequalis Grimshaw.

This is the correct subgenus combination for this species. See Richards, p. 430.

Sphaeroceridae is apparently the oldest family name for this group (Macquart, 1835). This name is the most widely used in the present day literature and is preferred by the leading workers on the family. Hendel (1922) and others have used Cypselidae based upon the earlier Meigen name, *Cypsela* (1800); *Borborus* Meigen (1803) is apparently synonymous with *Cypsela*. Dr. Richards does not approve of the use of the Meigen 1800 names and reports that there is so much confusion with regard to the name *Borborus* Meigen that he feels *Sphaerocera* Latreille (1804) (and Sphaeroceridae) is the best name to use.

TETHINIDAE

Tethina albula (Loew), 1869, Berl. Ent. Ztschr. 13:44 (*Rhicnoëssa*), North America.

First recorded by Wirth (1947, "Proceedings" 13:21) from Oahu. This species is common on the beaches.

T. sp.?

A small pale colored, brownish yellow to rufous, species. Taken on the beach at Waimanalo, Oahu, September 1951 (Adachi and Hardy).

NOTES

T. insularis Aldrich.

Recorded by Bryan from Pearl and Hermes Reef. This species is now very common on the beaches of Oahu, and probably is on the other Hawaiian Islands. *Tethina insularis* is distinguished from *T. albula* (Loew) by the narrow cheeks (half the width of the third antennal segment), all black bristles and dark gray color. *T. albula* has very broad cheeks (much wider than the third antennal segment), yellowish bristles and is silvery gray pollinose.

In a recent letter, Sabrosky said that four species (possibly three) of *Tethina* were in a collection which I had sent to him. Some of these may be undescribed. The *Tethina* sp.? recorded above was probably represented in this collection.

OTITIDAE

NO ADDITIONAL RECORDS

CORRECTIONS

Physiphora aenea F.

Change of combination for *Chrysomyza aenea* (F.). Fallén (1817, Scenopinii p. 3) proposed *Chrysomyza* to replace *Physiphora*, which he considered to be preoccupied, by *Physsophora* Förskål. Since *Physiphora* was not actually preoccupied it has been reinstated (Hennig, 1941, Ent. Beiheft 8:117, and Steyskal, B. P. Bishop Mus. Occ. Pap., in press).

Pseudeuxesta prima Osten Sacken, 1881, Mus. Stor. Nat. Geneva Ann. 16:470.

Change of name for *Euxesta semifasciata* Malloch. Synonymy recorded by Hendel (1931, Verh. Zool. Bot. Ges. Wien 81:4) and Malloch (1932, B. P. Bishop Mus. Bull. 98:208-209).

NOTES

The family name for this group of flies is still very controversial. No official decision has been made by the International Commission for Zoological Nomenclature regarding the correct name. As was pointed out by Aldrich (1932, Proc. U. S. Nat. Mus. 81[Art. 9]:7) *Ortalis* Fallén (1810) is preoccupied by *Ortalis* Merrem (1786) so the name Ortalidae is not available for use in the Diptera. Aldrich proposed the new family name Otitidae, based on *Otites* Latreille (1804). As was pointed out by Sabrosky (1946, Proc. Ent. Soc. Wash. 48[7]:168) Aldrich did not base his new family name upon the generic name which replaced *Ortalis*, but changed the type genus. This was an unfortunate procedure since it presents the possibility of changing the family concept.

Sabrosky further points out that *Ortalis* of authors is apparently equal to *Ceroxys* Macquart and "the subfamily Ortalinae of authors must . . . be known as Ceroxydinae." Following this concept, George Steyskal, Grosse Ile, Michigan, has proposed the family name Ceroxydidae (see Sabrosky, l.c.:168) to replace Ortalidae and Otitidae. Steyskal's name has, however, not been accepted and Otitidae is the name which is in general use throughout the world.

The genus *Scholastes* has been treated in some of our literature under the family name Platystomatidae, following Brues and Melander, Hennig, *et al.* Based upon the opinions of Sabrosky and Steyskal, it is perhaps best that we consider this group as a subfamily under Otitidae.

TEPHRITIDAE

(Change of name for Trypetidae)

Dacus (Strumeta) dorsalis Hendel, 1912, Suppl. Ent. 1:18. Formosa, India, Malaya, Thailand, French Indo China, Dutch East Indies, Burma, Philippine Islands, Ryukyu Islands, and Marianas.

First recorded from Oahu by Fullaway (1947, "Proceedings" 13:8) in May, 1946. It was probably brought in from Saipan by returning troops as early as the late summer of 1944. It is abundant on all of the islands and is the most serious pest of fruits in the Territory.

Procecidiochares utilis Stone, 1947, "Proceedings" 13:97-98.

"Reared from stem galls on *Eupatorium adenophorum*" (syn. of *E. glandulosum*) from Mexico and Oahu. This species was imported from Mexico in an attempt to effect biological control of pamakani (*Eupatorium glandulosum*). It is common on Oahu, Maui, Lanai, and Molokai (the latter two are new island records from observations made by Dr. H. A. Bess).

NOTES AND CHANGES

Dacus (Strumeta) cucurbitae Coquillett.

This is the correct combination for *Chaetodacus cucurbitae* (Coquillett).

Tephritis *sens. str.* spp.

There has been considerable controversy concerning the status of our native *Tephritis* (see Bryan, 1924, "Proceedings" 5:367). Our species possess characters intermediate between two genera. Bezzi (in correspondence to Bryan) considered it best to retain our species in *Tephritis* although he admitted that "they are very like *Trypanea* in having a star-shaped terminal spot, which is, however, combined with a net-like pattern continued to the base of the wing." He said, "these species seem to form a group peculiar to the Islands, only the unknown *limpidapex* being a more typical *Tephritis*." Aldrich (by letter to Bryan) referred the species *crassipes, cratericola* and *dubautiae* to *Trypanea*. Bryan preferred to keep these in *Tephritis* and proposed a new subgenus, *Trypanoidea* (l.c.) to contain these species. Malloch (1931, Rec. Cant. Mus. 3:389, and 1933, Dipt. Patag. So. Chile 6 (4) :275) says that it is not practical to separate *Tephritis* and *Trypanea* on the basis of wing patterns and unless we are prepared to erect several new genera we must sink *Tephritis* as a synonym, or at most subgenus, of *Trypanea* (*Urellia*). Much work remains to be done before the true position of our species can be understood.

Rhagoletis sp.?

Larvae of a *Rhagoletis* were recovered at Honolulu in a box of cherries shipped in from Seattle (Krauss, 1941, "Proceedings" 11:15). This is not established in the Territory.

PIOPHILIDAE

NO ADDITIONAL RECORDS

CHYROMYIDAE

(In our literature as Chiromyiidae)

The original spelling of the type genus by Robineau-Desvoidy was *Chyromya* and there have since been numerous emendations and misspellings.

ADDITIONS AND CORRECTIONS

Chyromya spp.?

One species has been recorded in our literature as "*Chiromyia* (*Scyphella*) *flava* (L.)." Most of the species of *Chyromya* are uniformly pale yellow, and various species throughout the world have been commonly misidentified as *flava*. It is now obvious that *C. flava* does not occur in Hawaii. Our species (possibly two) runs to *C. concolor* Malloch, in Malloch's key to the species of this genus (1914, Proc. Ent. Soc. Wash. 16: 179-181). Dr. M. R. Wheeler (University of Texas) compared some of

our specimens with *C. concolor* taken in Texas and stated that our species is evidently different. Curtis W. Sabrosky (U. S. National Museum) says it looks as though there are two species of *Chyromya* in Hawaii and neither is *flava* or *concolor.*

Specimens of *Chyromya* are common on windows in Honolulu during the winter months.

Aphaniosoma sp.?

Probably new, related to *A. thoracalis* Hendel (from Formosa) but not fitting the original description. This species has been taken by sweeping *Scaevola* on the beaches on the windward side of Oahu. The presence of this genus in Hawaii was first reported by Hardy (1952, "Proceedings" 14:355).

CANACEIDAE

ADDITIONAL RECORDS

Placopsidella cynocephala Kertész, 1901, Termes. Fuzet. 24:425. New Guinea, Solomon Is., and Java.

First reported in Hawaii by Adachi (1952, "Proceedings" 14:354) from Oahu.

Procanace williamsi Wirth, 1951, Bishop Mus. Occ. Pap. 20 (14) :257-258.

Described from Oahu.

CHANGES

Canaceoides nudata (Cresson).

Change of combination for *Canace nudata* Cresson (1934, Trans. Amer. Ent. Soc. 9:221). This is the genotype of *Canaceoides* Cresson.

EPHYDRIDAE

ADDITIONAL RECORDS

Apulvillus mauiensis Wirth, 1948, "Proceedings" 13:300.

From Maui.

A. williamsi Wirth, l.c.:299.

From the island of Hawaii.

Atissa oahuensis Cresson, 1948, Trans. Amer. Ent. Soc. 74:24.

Described from Oahu.

Ceropsilopa coquilletti Cresson, 1922, Ent. News 33:136.

Nearctic and Neotropical species. First recorded by Adachi, determined by Wirth (1952, "Proceedings" 14:354) Oahu.

Chaetoscatella sp.? (probably endemic).

Recorded by Wirth (1947, "Proceedings" 13:22) from Oahu.

Clasiopella uncinata Hendel, 1914, Suppl. Ent. 3:110.

Formosa and Pacific islands. In the U. S. National Museum and H.S.P.A. collections from Guam and Midway ("very common on planes"). First recorded in Hawaii by Adachi, determined by Wirth (1952, "Proceedings" 14:353) from Oahu.

Discocerina mera Cresson, 1939, Notulae Nat. 21:6.
Formosa and Pacific islands. First recorded in Hawaii by Adachi, determined by Wirth (1952, "Proceedings" 14:353) from Oahu.

Ephydra gracilis Packard, 1872, Amer. Jour. Arts and Sci., 3rd ser., 1:103.
From western America. First recorded in Hawaii by Wirth (1947, "Proceedings" 13:141) from Oahu. This species breeds in the salt water pools in the Pearl Harbor area.

Ephydra riparia Fallén, 1813, K. Vetensk. Akad. Handl., p. 246. Holoarctic.
New record (determined by Wirth) from Ala Wai Canal, Waikiki, Oahu, April 16, 1950 (Marian Adachi).

Gymnopa grandis Cresson, 1925, Trans. Amer. Ent. Soc. 51:232.
From Formosa. First reported by Adachi, determined by Wirth (1952, "Proceedings" 14:353) from Oahu. This has been taken along the beaches on *Scaevola*.

G. tibialis (Cresson), 1916, Ent. News 27:149.
North America, Canada and Central America. First reported in Hawaii by Adachi, determined by Wirth (1952, "Proceedings" 14:353) from Molokai.

Hostis guamensis Cresson, 1945, Trans. Amer. Ent. Soc. 71:64-65.
From Guam. First recorded from Hawaii by Adachi, determined by Wirth (1952, "Proceedings" 14:353) from Oahu. Found along the beaches.

Hydrellia hawaiiensis Cresson, 1936, Trans. Ent. Soc. Amer. 62:263-264.
Described from Oahu.

H. williamsi Cresson, 1936, Trans. Ent. Soc. Amer. 62:259-261.
First reported by Williams (1937, "Proceedings" 9:359) as a dipterous leaf miner in *Lemna* plants from Kukuiala Valley, Oahu. He said it had been taken previously on Molokai.

Lytogaster gravida (Loew), 1863, Berl. Ent. Zeits. 4:98 (*Hyadina*).
Alaska and United States. New record for Hawaii based upon specimens from Pauahi, Hawaii, August 12, 1949 (D. E. Hardy), determined by Wirth.

L. aldrichi? Cresson, *nomen nudum*? (see notes).
Referred to by Williams, 1938, "Proceedings" 10:87.

Mosillus sp.?
Reported by Krauss (1945, "Proceedings" 12:222). From Kauai.

Neoscatella cilipes Wirth, 1948, "Proceedings" 13:288.
From Oahu and Kauai.

N. clavipes Wirth, l.c.:289-290.
From the island of Hawaii.

N. clavipes tenda Wirth, l.c.:290.
From Oahu.

N. fimbriata Wirth, l.c.:286-288.
From Oahu.

N. kauaiensis Wirth, l.c.:282-284.
From Kauai.

N. oahuensis (Williams), 1938, "Proceedings" 10:107 (*Scatella*).
From Oahu. The change of combination was made by Wirth (1948, "Proceedings" 13:295).

Polytrichophora n. sp.
In the U. S. National Museum collection, "from Hawaii." Will be described by Wirth. This is a new record for this genus in the Territory.

Psilopa girschneri von Roeder, 1889, Ent. Nachr. p. 55.
Described from Europe. Cresson has recorded this species from various localities in western America and Alaska, but Wirth (correspondence) says that Cresson later put this in *P. olga* Cresson and *dimidiata* Cresson; the latter is a synonym of *olga*. Wirth reports having specimens of this species in the U. S. National Museum, "from Hawaii." This is a new record for the Territory.

Genus (prob. new) between *Limnellia* and *Scatella* sp.?

Determined by Wirth. One specimen from Pauahi, Hawaii, August 12, 1949 (D. E. Hardy). Wirth gave the following notes on this species: "wing pattern strongly resembling that of *Limnellia* spp., but head bristles of a specimen in U. S. National Museum from Volcano, Hawaii, as in *Scatella* and abdomen not shining."

CORRECTIONS AND NOTES

Discomyza maculipennis (Wiedemann).
Erroneously accredited to Cresson by Bryan.

Notophila insularis Grimshaw.
Correct combination for *Paralimna insularis* (Grimshaw) (according to Wirth, in correspondence).

Hecamede persimilis Hendel.
Correct name for our Hawaiian *Hecamede*. *H. femoralis* Malloch, as recorded by Wirth (1947, "Proceedings" 13:21) is a synonym (*vide* Cresson, 1948, Trans. Amer. Ent. Soc. 74:23) and the use of *H. albicans* (Meigen) in our literature has been based upon misidentifications; true *albicans* is a European species.

Neoscatella bryani (Cresson).
Change of combination for *Scatella bryani* Cresson (Cresson, 1935, Trans. Amer. Ent. Soc. 61:360).

N. hawaiiensis (Grimshaw).
Change for *S. hawaiiensis* Grimshaw (Cresson, l.c.).

N. sexnotata (Cresson).
Change for *S. sexnotata* Cresson (Cresson, l.c.).

N. terryi (Cresson).
Change for *S. terryi* Cresson (Cresson, l.c.).

N. warreni (Cresson).
Change for *S. warreni* Cresson (Cresson, l.c.).

Lytogaster willistoni Cresson, 1916, Ent. News 27:150.
California. This is a synonym of *L. gravida* (Loew) according to Cresson (1949, Trans. Amer. Ent. Soc. 74:256). *L. willistoni* was recorded from Oahu by Williams (1937, "Proceedings" 10:6).

Wirth (correspondence) has reported that he can find no record of a *Lytogaster aldrichi* Cresson, as reported in our literature (Williams, 1938, "Proceedings" 10:87). He said that this may have been a manuscript name of Cresson's.

DIASTATIDAE

This family does not occur in Hawaii. According to Sabrosky *Pseudiastata* belongs in the family Drosophilidae. See note below.

DROSOPHILIDAE

ADDITIONAL RECORDS

Bunostoma n. sp.? related to **flavifacies** Malloch.
Determined by Wheeler. This is the first record of this genus occurring in Hawaii. Just two specimens have been seen to date: one from Honolulu, Oahu, February 21, 1951 (R. van den Bosch), and one from Waimanalo, Oahu, January 22, 1951 (D. E. Hardy).

Bunostoma sp. #2.
A second, unrecorded species of this genus is on hand from the following localities on Oahu: Haleauau Valley, Mt. Kaala, April 21, 1949 (G. B. Mainland); Manoa Valley, June 1950 (D. E. Hardy); and Honolulu, September 1951 (D. E. Hardy).

Chymomyza procnemis (Williston), 1896, Trans. Ent. Soc. Lond. p. 412.
Nearctic and Neotropical regions. First recorded in Hawaii by Zimmerman (1938, "Proceedings" 10:131) from Oahu.

Dettopsomyia formosa Lamb, 1914, Trans. Linn. Soc. Lond. 16 (4) :349.
Seychelles Islands. First recorded in Hawaii by Malloch (1938, "Proceedings" 10:54) from Oahu. This species is one of the most beautiful as well as the smallest (length 1.5 mm.) of the Drosophilidae. Because of its small size, however, it is easily overlooked.

Drosophila ananassae Doleschall, 1858, Nat. Tijd. Neder. Ind. 17:128.
Cosmopolitan. First recorded in Hawaii by Zimmerman (1943, "Proceedings" 11:347) from Oahu.

D. busckii Coquillett, 1901, Ent. News 12:16.
United States. First recorded in Hawaii by Davis (1947, "Proceedings" 13:14) (determined by Mainland) from Kilauea, Hawaii. This species is also common on Oahu.

D. deltaneuron Bryan, 1938, "Proceedings" 10:40-41.
Described from Oahu.

D. hydei Sturtevant, 1921, Carn. Inst. Wash. Pub. 301:101.
United States. First recorded in Hawaii by Zimmerman (1943, "Proceedings" 11:346) from Oahu.

D. immigrans Sturtevant, 1921, Carn. Inst. Wash. Pub. 301:83.
Cosmopolitan. First reported in Hawaii by Mainland (1949, "Proceedings" 13:327) from Oahu.

D. lulumahu Bryan, 1938, "Proceedings" 10:39-40.
Described from Oahu.

D. mercatorum Patterson and Wheeler, 1942, Univ. of Texas Pub. 4213:93.
United States. First recorded in Hawaii by Zimmerman (1943, "Proceedings" 11:346) from Oahu.

D. montium de Meijere, 1916, Tijd. vor Ent. 59:205.
Orient and Pacific. First recorded in Hawaii by Zimmerman (1943, "Proceedings" 11:347) from Oahu.

D. polychaeta? Patterson and Wheeler, 1942, Univ. of Texas Pub. 4213: 102.
United States. New record for Hawaii based upon specimens collected in banana trap at the University of Hawaii, March 1948 (G. B. Mainland). This is the species which Dr. Mainland listed, *nomen nudum,* as *D. pattersoni* n. sp. in "Drosophila Information Service" 22:59 (1948). It was listed by Patterson and Wheeler (1949, Univ. of Texas Pub. 4920: 229) as *"D. pattersoni,* Manuscript name."

I was unable to distinguish this from *D. polychaeta* and sent the series (five specimens) to Dr. Wheeler. He said "on the basis of present information, your specimens are certainly *polychaeta,* or a closely related form. If we could get hold of a living stock or a larger series, we should be able to examine the male genitalia, etc., and come to a more precise decision. At the moment, I strongly suspect that it is really *'polychaeta'*."

D. repleta Wollaston, 1858, Ann. Mag. Nat. Hist. 41:117.
Madeira. First recorded in Hawaii by Mainland (1949, "Proceedings" 13:327) from Oahu.

D. sadleria Bryan, 1938, "Proceedings" 10:41-42.
Described from Oahu.

D. simulans Sturtevant, 1919, Psyche 26:153.
Cosmopolitan. First recorded in Hawaii by Zimmerman (1943, "Proceedings" 11:347) from Oahu.

D. spinofemora Patterson and Wheeler, 1942, Univ. of Texas Pub. 4213: 103.
Described from Hawaii but obviously an immigrant species. Very probably common on all of the islands, especially in guava thickets.

D. spp. near **melanosoma** Grimshaw, near **carinata** Grimshaw, near **paucipuncta** Grimshaw and near **cognata** Grimshaw.
Recorded from Lulumahu Canyon, Oahu, by Williams, 1938, "Proceedings" 10:121.

D. sp.?

Two specimens are at hand from Poamoho, Oahu, Nov. 19, 1948 (D. E. Hardy) which evidently represent an unrecorded (possibly undescribed) species. I had considered this species to belong to the *polychaeta* group but Dr. Wheeler after studying the specimens concluded that our species is not related to *polychaeta*, "in fact are [specimens] not especially close to anything we know of." This may possibly be a native species but it is unusual to find endemic forms in areas such as Poamoho.

Scaptomyza graminum (Fallén), 1823, Dipt. Suec. Geomyz. 8 (*Drosophila*).

Palaearctic and Nearctic regions. First reported in Hawaii by Hardy (1952, "Proceedings" 14:346) from Oahu. It has also been seen from Kauai. Nothing is known about the habits of this leaf-mining species in Hawaii.

Tantalia albovittata Malloch, 1938, "Proceedings" 10:53-54.

Described as a new genus and species from Oahu. This is a tiny, inconspicuous species (length, 1.5 mm.).

Titanochaeta bryani Wirth, 1952, "Proceedings" 14:417.

Ex spider egg sacks from Manoa Valley, Oahu.

T. swezeyi Wirth, 1952, "Proceedings" 14:415.

Ex spider egg sacks from Maui.

NOTES AND CORRECTIONS

Titanochaeta ichneumon Knab.

This is now known from the islands of Hawaii and Oahu. The larvae of this genus are predaceous upon spider eggs.

Pseudiastata pseudococcivora Sabrosky, 1951, Bull. Ent. Res. 41:624-625.

Sabrosky says, "This is undoubtedly the species which was introduced (as *P. nebulosa*) into Hawaii on several occasions between 1924 and 1932 for the control of the pineapple mealybug (Fullaway, 1933)." I have sent specimens of this to Sabrosky and he has confirmed that our species is *P. pseudococcivora*. The genus *Pseudiastata* was placed in the family Geomyzidae by Coquillett and was referred to the Drosophilidae by Melander (1913, Psyche 20:166-169). It is listed in our literature under the family Diastatidae.

It is apparent that the *Pseudiastata* introduced into Hawaii has not become established; it has never been recovered here.

Drosophila mulleri Sturtevant.

Has been recorded in our literature but the records were evidently based upon misidentifications of *D. hydei* Sturtevant (*vide* Zimmerman, 1943, "Proceedings" 11:346).

This is the second largest family of flies in Hawaii, according to the known number of species. We have a very rich endemic fauna, especially of *Drosophila*. To date eighty species have been recorded for the family. These are enumerated below by genera. *Pseudiastata* is not included since this is not established in Hawaii.

Bunostoma	2 species	(probably immigrants)
Chymomyza	1 species	(immigrant)
Dettopsomyia	1 species	(immigrant)
Drosophila	62 species	(11 immigrant, 51 endemic)
Gitona	1 species	(immigrant)
Hypenomyia	1 species	(endemic)
Idiomyia	7 species	(endemic)
Scaptomyza	1 species	(immigrant)
Tantalia	1 species	(endemic)
Titanochaeta	3 species	(endemic?)
	80	

It is apparent that there are many undescribed species of *Drosophila* in the Islands. A tremendous amount of work remains to be done on this group. Some workers have estimated that there must be two hundred to three hundred species of Drosophilidae in Hawaii.

ASTEIIDAE

ADDITIONAL RECORDS

Asteia nudiseta Sabrosky, 1947, "Proceedings" 13:55-56.
Described from Oahu.

NOTES

The genus *Stenomicra* occupies a very questionable position. It is an aberrant group whose true family position is much disputed. It resembles some Opomyzidae. Sabrosky agrees with Malloch (1927, Ann. and Mag. Nat. Hist. ser. 9, 20:23-26) that it is near the drosophilid-asteiid complex. Malloch thought it best to consider it as an asteiid.

Stenomicra angustata Coquillett.

This has been recorded with a query in our literature. Specimens in the H.S.P.A. collection labelled as *S. angustata* were determined by Sabrosky as *S. orientalis* Malloch. *S. angustata* Coquillett is a very distinctive species characterized from other known species of the genus by having the second section of the costa (the section between the apices of the 1st and 2nd longitudinal veins) not much longer than the third costal section. No specimens fitting this character have been found in any of the Hawaiian collections.

CHLOROPIDAE

ADDITIONAL RECORDS

Chlorops *sens. lat.* sp.?

Determined by Sabrosky. First recorded by Hardy (1952, "Proceedings" 14:408) from Oahu.

Conioscinella sp.

Determined by Sabrosky. First reported by Wirth (1947, "Proceedings" 13:21). Locality not given; probably from Oahu.

Oscinella sp.?

Determined by Sabrosky, from Oahu (probably Honolulu; the specimens have not been returned). This has not previously been recorded in our literature.

Gaurax (*sens. lat.*) **bicoloripes** Malloch.

Determined by Sabrosky. First reported from Hawaii by Hardy (1952, "Proceedings" 14:408) from Oahu. Sabrosky has indicated that at the present time it is not possible to put this species into its correct generic combination. See my notes, p. 409.

CHANGES AND NOTES

Cadrema pallida (Loew).

Has been in our literature as *Prohippelates pallidus,* and earlier as *Hippelates nigricornis* Thomson. The correction was recorded by Wirth (1947, "Proceedings" 13:22).

Rhodesiella.

Has been in our literature under the family Carnidae, but this genus belongs under Chloropidae, according to Sabrosky.

R. scutellata (de Meijere).

Not Meigen, as recorded by Wirth (1947, "Proceedings" 13:22). This species has been in our literature as *R. tarsalis* Adams. This was corrected by Wirth (l.c.: 13:22). Sabrosky, in correspondence, has pointed out that *tarsalis* is a distinct African species and the records of this species occurring in Hawaii were based upon misidentifications.

CARNIDAE

This family does not occur in Hawaii. The genus *Rhodesiella,* in our literature under Carnidae, belongs under Chloropidae.

LONCHAEIDAE

(New family record)

Lamprolonchaea aurea (Macquart), 1850, Dipt. Exot. Suppl. 4:300.

Widespread throughout the Pacific. This is the first record of this family occurring in Hawaii. Specimens have been seen from both the windward and leeward sides of Oahu (Hardy, 1952, "Proceedings" 14:363, 408).

This species is easily distinguished from other members of the genus by its greenish color and convergent third and fourth veins in the wings. The rugose frons is also characteristic; only one other species, *L. rugosifrons* Bezzi, from Australia, possesses this character.

MILICHIIDAE

ADDITIONAL RECORDS

Desmometopa palpalis de Meijere, 1914, Tijdschr. Ent. 57:251. From Java.

New record for this species. It is common on Oahu. It breeds in abundance in manure and compost. See notes below under *D. tarsalis.*

Desmometopa sp.?

A large series of specimens are on hand which differ from the other two species of this genus known from Hawaii. These have been collected largely on windows on the University of Hawaii campus, March to September, 1951 (D. E. Hardy, M. Adachi).

The species differs from the other Hawaiian *Desmometopa* by being subshining black, with the sternopleura polished and with a polished black line extending beneath each eye. The mid and hind tarsi are conspicuously yellow (especially the metatarsi) and the wing veins, including the costa, are pale in color, yellowish to whitish.

Milichiella sp.? related to **circularis** Aldrich.

This species has not been previously recorded in our literature. A series of specimens was taken hovering behind the U.S.D.A. Dole Street laboratory in Honolulu, September-October, 1951 (J. W. Beardsley); it has also been taken on window, Honolulu, November 1951 (D. E. Hardy).

CORRECTIONS AND NOTES

Desmometopa tarsalis Loew, 1865, Dipt. Amer. Sept. Ind. 6:96.

This is the correct name for *D. m-nigrum* as used in the Hawaiian literature. I have studied all of the available specimens of Hawaiian *Desmometopa,* and find none which fits the concept of *m-nigrum* (see Malloch, 1934, Ins. Samoa 6[8]:327).

Material which Aldrich misidentified as *D. m-nigrum* and later as *D. tarsalis* (1929, "Proceedings" 7:233) appears to be *palpalis* de Meijere (*sensu* Malloch, 1934, l.c.).

CHAMAEMYIIDAE

(Change of name for Ochthiphilidae)

NO NEW RECORDS

According to Sabrosky "Ochthiphilidae is the oldest family name but *Ochthiphila* equals *Chaemyia* and the family name has been changed to Chamaemyiidae in accordance with that."

ANTHOMYZIDAE

(New family record)

Ischnomyia n. sp.?

Determined by Sabrosky, based upon specimens from various localities on Oahu. This is no doubt the same species as has been recorded by Wirth (1947, "Proceedings" 13:21) as *Mumetopia* sp.? determined by Greene from Oahu and Hawaii. He recorded this under the family Opo-

myzidae. Sabrosky has stated, in correspondence, "The '? *Mumetopia*' seems to me nearest *Ischnomyia*, but I cannot place it except as a probable new species."

AGROMYZIDAE

ADDITIONAL RECORDS AND CORRECTIONS

Liriomyza canomarginis Frick, 1952, "Proceedings" 14:511.
Described from Oahu, ex *Indigofera*.

L. hawaiiensis Frick, 1952, l.c.:513.
Described from Oahu, Lanai, Maui and Hawaii; ex tomato, *Cleome*, cabbage, *Nasturtium* and daikon.

L. minutiseta Frick, 1952, l.c.:512.
From Oahu, ex tomato, cauliflower, squash and eggplant.

L. pullata Frick, 1952, l.c.:509.
From Oahu and Molokai, ex *Datura, Lipochaeta* sp. and aster.

The above species of *Liriomyza* have previously been confused in our literature under the name *L. pusilla* (Meigen). This complex is being studied by Kenneth E. Frick, Washington State College.

Melanagromyza simplex (Loew), 1869, Dipt. Amer. Sept. Indig., Berl. Ent. Zeitsch. 8:84.
North America, a miner in asparagus. Change of name (Frick, in correspondence) for *Agromyza simplex* Loew. This species was first recorded from Hawaii by Swezey and Bianchi (1938, "Proceedings" 10:11) as a pest of asparagus on Oahu.

Melanagromyza sp.?
Determined by Frick. Reported in our literature as *Agromyza simplex* Loew, by Hardy, (1951, "Proceedings" 14:227) from specimens reared from celery at Kamuela, Hawaii. Frick later studied specimens of this series and reported that *M. simplex* is restricted to asparagus. He says the totally black species of this genus are difficult to separate and he is unable to place our species from celery.

It is interesting to note that an agromyzid has recently been reported damaging celery in Australia (1950, Agr. Gaz. 61[9]:473). This species has recently been described as *Melanagromyza apii* Hering, 1951, Ann. and Mag. Nat. Hist., ser. 12, 4:736-745.

M. spp.?
Determined by Frick, partly recorded by Mitchell (1951, "Proceedings" 14:224), reared from leaves of African marigold, lettuce and celery, and from stems of *Gnaphalium*, sunflower and *Zinnia*, from Oahu.

Napomyza sp.?
Reported by Wirth (1947, "Proceedings" 8:21) from Oahu.

Dizygomyza (Calycomyza) humeralis (von Roser), 1840, Würtemb. Landwirths. ver. Korresp., N.S. 8, Nachtrag dazu I, Heft 1:49-64 (*Calycomyza*), Holarctic.
Determined by Frick. First reported from Hawaii by Wirth (1947, "Proceedings" 13:21) under the name *Calycomyza artemisiae* (Kaltenbach),

determined by Greene. It was also reported by Mitchell (1950, "Proceedings" 14:224) under the name *Agromyza* (*sens. lat.*) sp. (*jucunda* van der Wulp of authors), determined by Sabrosky. It has been reared only from China aster, and collected in light traps on Oahu.

D. (Calycomyza) jucunda (van der Wulp), 1867, Tijdschr. v. Ent. 10:161.
United States. Determined by Frick from specimens taken on Oahu, by sweeping.

Phytoliriomyza perpusilla (Meigen), 1830, Syst. Beschreib. der bekannt. Europ. Zweifl. Insekten 6:181. Holarctic.
New record for the Territory based upon specimens, determined by Frick, taken by sweeping, from Honolulu.

Pseudonapomyza spicata (Malloch).
Change of name for *Phytomyza spicata* Malloch (1914, Ann. Mus. Nat. Hung. 12:334) (Frick, in correspondence). This was described from Formosa. First recorded in Hawaii by Van Zwaluwenburg (1947, "Proceedings" 13:30), reared from grasses on Oahu. Present also on Molokai, Maui and Hawaii.

NOTES

The literature dealing with Hawaiian agromyzids has been greatly confused. Most of our records have been based upon misidentifications and of the previously recorded species only the name *Ophiomyia lantanae* (Froggatt) is valid.

Our *Liriomyza* have been commonly recorded as *L. pusilla* (Meigen). It is now apparent, according to Frick, that *L. pusilla* does not occur in Hawaii and that a complex of species has been going under this name.

OESTRIDAE

NO ADDITIONAL RECORDS

CORRECTIONS

Hamaxia incongrua Walker.
Placed in this family by Townsend (1936, Manual of Myiology 3:93). See note on this species in the next family.

LARVAEVORIDAE

(Change of name for Tachinidae)
(Including Townsend's Dexiidae, Exoristidae and Gymnosomatidae)

ADDITIONAL RECORDS

Eucelatoria armigera (Coquillett), 1889, Insect Life 1(11):331-332 (*Tachina*).
California, Florida, Puerto Rico, and Mexico. First recorded from Hawaii by Pemberton (1943, "Proceedings" 11:265) from Oahu. This fly parasitizes a wide variety of caterpillars and is now known from Oahu, Molokai, Hawaii, Maui, and Kauai.

CORRECTIONS AND NOTES

Achaetoneura archippivora (Williston).

Change of combination for *Frontina archippivora* (Williston), described under *Masicera* (Weber, 1930, Proc. U. S. Nat. Mus. 78[10]:20-24).

This change of combination was brought to my attention by Paul Arnaud, Redwood City, California. He further pointed out that Townsend (1941, Manual of Myiology 11:226) stated that *Masicera archippivora* Williston belongs in his genus *Ypophaemyiops* (genotype: *Prophryno myersi* Aldrich, from British Guiana). If Townsend's synonymy is correct, we will have to use *Ypophaemyiops*. Sabrosky (correspondence) commented on this point as follows: "Townsend's genus seems to me too fine a split."

Chaetogaedia monticola Bigot.

Townsend (1936, Manual of Myiology 4:178) says, "What has been called *Chaetogaedia monticola,* is not Bigot's *monticola* which has the female third antennal joint only a little longer than the second, but is probably *vilis* Wp. or an allied species."

Hamaxia incongrua Walker.

Correct name for *Ochromeigenia ormioides* Townsend. (Townsend, 1936, Manual of Myiology 4:279.) Townsend (*op. cit.,* 3:93) places *Hamaxia* in the family Oestridae. This fly is not established in Hawaii, in spite of repeated introductions. The synonymy is by Townsend who examined Walker's types of *H. incongrua* in London (U.S.D.A. Tech. Bull. 366, p. 8, 1933).

Paradionaea atra (Townsend).

Leucostoma atra Townsend is the genotype of *Paradionaea* (Townsend, 1936, Manual of Myiology 3:80).

SARCOPHAGIDAE

ADDITIONAL RECORDS

Amobia (Pachyophthalmus) sp.?

Possibly new, determined by Sabrosky. First reported by Swezey (1951, "Proceedings" 14:221), reared from nest of *Eumenes latreillei petiolaris* (Schulz), Honolulu (see under notes for further discussion on this fly).

This has since been taken by Van Zwaluwenburg, Rosa, Mitchell, and Hardy in *Eumenes* nests at Waipio, Oahu, and several locations around Honolulu. The same collectors have found puparia, apparently of this fly, in the nests of *Sceliphron caementarium* (Drury).

Goniophyto bryani Souza Lopes, 1938, Bishop Mus. Occ. Pap. 14 (11) :195.

From the "N. W. Hawaiian Islands."

Helicobia morionella (Aldrich), 1930, Proc. U. S. Nat. Mus. 78:31 (*Sarcophaga*).

West Indies and California. This is a correction of name for the species recorded in our literature as *Helicobia helicis* (Townsend) by Williams (1937, "Proceedings" 9:362), associated with *Eulota similaris* on Oahu.

H. helicis is considered to be a synonym of *H. rapax* (Walker) (see Aldrich, 1930, Proc. U. S. Nat. Mus. 78[12]:15). This species apparently does not occur in Hawaii. Specimens which Williams had collected, determined as *H. helicis* by Smart, have been identified as *H. morionella* by H. R. Dodge.

This species has been recorded from several localities on Oahu and Kauai. It can be collected in large numbers by using dead snails as bait.

Sarcophaga albiceps Meigen, 1826, Syst. Beschr. 5:22.

Europe and India. First recorded in Hawaii by Lopes (1941, "Proceedings" 11:56) from Oahu.

S. knabi Parker, 1917, Proc. U. S. Nat. Mus. 54:96.

Philippine Islands, Guam, etc. First recorded by Tanada, *et al.* (1950, Jour. Econ. Ent. 43:31, reared from poultry manure at Honolulu). This species is rather common on Oahu.

S. orientaloides Senior-White, 1924, Rec. Ind. Mus. 26:244.

India and Ceylon. First recorded in Hawaii by Lopes (1941, "Proceedings" 11:56) from Honolulu. This species is common on Oahu.

S. ruficornis (F.), 1794, Ent. Syst. 4:314-316 (*Musca*).

The Orient and N. E. Africa. First reported in Hawaii by Joyce (1949, "Proceedings" 13:338) from Oahu and Kauai.

CORRECTIONS AND NOTES

Hystricocnema plinthopyga (Wiedemann).

Change of combination for *Sarcophaga plinthopyga* Wiedemann (*vide* Lopes, 1941, "Proceedings" 11:54).

Probellieria argyrostoma (Robineau-Desvoidy).

Change of name and combination for *Sarcophaga barbata* Thomson (Dodge, in correspondence). The synonymy of *S. barbata* with *S. argyrostoma* was pointed out by Seguy (1941, Mouches Parasites 2:77).

Sarcophaga peregrina (Robineau-Desvoidy).

Change of name for *S. fuscicauda* Boettcher. Synonymy pointed out by Lopes (1941, "Proceedings" 11:55).

Ravinia lherminieri (Robineau-Desvoidy).

Change of name and combination for *Sarcophaga pallinervis* Thomson (*vide* Lopes, 1941, "Proceedings" 11:54).

Mr. Sabrosky has reported (in correspondence) that "David G. Hall is working on a paper now which will describe a couple of new species and will list several new records of *Sarcophaga* from Hawaii."

The new *Amobia* presents a number of interesting biological problems. The species very obviously came into Hawaii in the mud nests of the *Eumenes* from New Guinea or that general region of the Pacific. The wasp was first collected in September, 1946 (Townes, 1947, "Proceedings" 13:105). It arrived during the war, probably on equipment coming back from the southwest Pacific.

In Hawaii the *Eumenes* provisions its nests only with the larvae of *Anacamptodes fragilaria* (Grossbeck). This geometrid moth migrated

here from California about the same time as the wasp, or shortly before. It was first collected in August 1944 (Pemberton, 1946, "Proceedings" 12:466).

Weber and Maehler (1948, "Proceedings" 13:206) found many nests of *Eumenes latreillei petiolaris* on the steamship "Furman Victory," from Manus and other South Pacific islands, "on the rudder, propellers and cradles of two motorboats carried as deck cargo. In one nest were found several empty dipterous puparia, evidently of two species." This gives an excellent lead as to the origin of the *Amobia*.

Townsend (1935, Manual of Myiology 2:201-202) gives the following information concerning the habits of the Miltogrammini (the tribe to which *Amobia* belongs): "The flies larviposit on the stored food supply in nests of burrowing wasps, bees and mud daubers or drop their maggots in the burrows while hovering in the air. The maggots feed externally on the grubs of the nest makers and on or even inside the comatose or decomposing insects with which the nests have been stored. . . . The maggots of the forms that breed in mud dauber nests pupate within the mud cells, the flies escaping through the thin partition walls between the cells until they find a host exit through the heavy outer wall."

CALLIPHORIDAE

ADDITIONAL RECORDS

Calliphora vicina (Robineau-Desvoidy), 1830, Myodaires, p. 435.

Cosmopolitan. First reported in Hawaii by Joyce (1950, "Proceedings" 14:5) from Honolulu.

Orthellia caesarion (Meigen), 1826, Syst. Beschr. 5:57.

Europe (cosmopolitan?). This has apparently been reported only from Niihau, by Fullaway, determined by Williams (1947, "Proceedings" 13: 53). This was reported under the combination *Cryptolucilia caesarion* (Meigen).

Prosthetochaeta near **lucilioides** Grimshaw.

Recorded from Lulumalu Canyon, Oahu, by Williams, 1938, "Proceedings" 10:122.

CORRECTIONS

Eucalliphora lilaea (Walker), 1849, List Dipt. Ins. Brit. Mus. 2:894 (*Musca*).

Change of name and combination for *Calliphora latifrons* Hough (*vide* Hall, 1948, "Blowflies of North Amer." Thomas Say Foundation, p. 284).

Phaenicia sericata (Meigen), 1826, Syst. Beschr. 5:53 (*Musca*).

Change of name and combination for *Lucilia sericata* (Meigen). (*vide* Hall, 1948, "Blowflies of North Amer." Thomas Say Foundation, p. 259).

Rhinia testacea Robineau-Desvoidy, 1830, Myodaires, 423.

This is the correct name for the species which has been referred to in the Hawaiian literature as *Stomorhina pleuralis* (Thomson). *R. testacea* was first recorded in our literature by Grimshaw (1902, Fauna Haw.

3:83). It was also mentioned by Perkins (1913, Intro. to Fauna Haw. 1:187) who said that the species first appeared in Hawaii in 1900 and "at once became very common." Since that time the name has not been used in our literature except for Illingworth's questioning of the identity of the species (1923, "Proceedings" 5:268). Apparently all records of *Stomorhina pleuralis* occurring in Hawaii should pertain to *R. testacea*. The former species was described from Keeling Is., near Sumatra and was recorded from Hawaii by Howard (1901, Proc. Ent. Soc. Wash. 4[4]:490) based upon specimens collected by H. W. Henshaw and determined by Coquillett. Sabrosky reports that specimens in the U. S. National Museum (from Hawaii) determined as *Stomorhina pleuralis*, by Coquillett and Bryan, are *Rhinia testacea*. I have checked all of the available specimens of this group in the Hawaiian collections and have found no *Stomorhina*.

GASTROPHILIDAE

NO ADDITIONAL RECORDS

MUSCIDAE

(Including the Anthomyiidae of Bryan, *et al.* as a subfamily of Muscidae)

ADDITIONAL RECORDS

Atherigona hendersoni Malloch, 1923, Ann. Mag. Nat. Hist. 12 (9) :184.

Henderson Island and Samoa. First recorded in Hawaii by Hardy (1952, "Proceedings" 14:346) from Oahu. This species is distinguished from other *Atherigona* by having the apices of the wings smoky fumose.

Graphomyia maculata (Scopoli) 1763, Ent. Carn., 326.

Cosmopolitan. First reported in Hawaii by Joyce (1949, "Proceedings" 13:329) from Honolulu.

Lispocephala kaalae Williams, 1938, "Proceedings" 10:118-119.

Described from Mt. Kaala, Oahu.

Musca sorbens Wiedemann, 1830, Aussereurop. Zweifl. Ins. 2:418.

Tropics and subtropics of the world. First reported in Hawaii by Joyce (1949, "Proceedings" 14:3) from Oahu.

Muscina stabulans (Fallén), 1816, K. Vetenskap. Akad. Förh., 225 (*Musca*).

Cosmopolitan. First reported in Hawaii by Joyce (1949, "Proceedings" 13:333) from Oahu.

CORRECTIONS AND NOTES

Musca vicina Macquart.

Listed as a synonym of *domestica* by Bryan. Sabrosky, van Emden, *et al.* consider this to be a subspecies of *domestica*. Sabrosky says that, "some intermediate populations are difficult to name to subspecies," and it is perhaps better to continue to refer to our housefly as just *Musca domestica*.

Siphona irritans (L.).

Change of combination for *Lyperosia irritans* (L.). (Decision of the Committee on Zoological Nomenclature at the U. S. National Museum.) Used in "Common Names of Insects Approved by the American Associa-

tion of Economic Entomologists" (Muesebeck, 1946, Jour. of Econ. Ent. 39[4]:432, 447, and 1950, l.c. 43[1]:122, 137).

Ophyra aenescens (Wiedemann).

Bryan stated that this species is probably not in Hawaii. Sabrosky (1949, "Proceedings" 13:427) confirms that it does occur here. This is probably the species which has been recorded in our literature as *O. nigra* (Wiedemann).

Ophyra leucostoma (Wiedemann).

Sabrosky (l.c.:428) says the records of this species in our literature (Grimshaw, 1901, Fauna Haw. 3[1]:30 and Howard, 1901, Proc. Ent. Soc. Wash. 4:490) were probably based upon misidentifications. If these records are correct the species does not appear to have become established in the Territory.

O. nigra (Wiedemann).

This species probably does not occur in Hawaii (Sabrosky, 1949, l.c.: 423). The records of it in our literature probably should refer to *aenescens.*

Hylemya.

Correction for *Hylemyia,* based upon opinion of C. W. Sabrosky (in correspondence).

Hylemya cilicrura (Rondani).

Recently appeared in the British literature under the combination *Chortophila cilicrura* (Rondani) (Miles, 1951, Bull. Ent. Res. 41[2]:343-354). I consulted Sabrosky concerning this usage and he replied as follows: "The use of *Chortophila* may be partly a matter of continuing old English usage, or it may be based on an article on possible generic groupings on the Anthomyinae, by Collin (1927, Ent. Mo. Mag. 63:129-135). However, Collin's article was only suggestive, not definitive. As recently as February, 1951 (Ruwenzori Report), van Emden still uses *Hylemya* (as *myia*) *cilicrura,* and so does Huckett." Sabrosky recommends that we continue to use the combination *Hylemya cilicrura.*

HIPPOBOSCIDAE

ADDITIONAL RECORDS

Olfersia aenescens Thomson, 1868, Eugenies Resa, 2 Zool. (1) Insekter, 610.

Widely distributed over all tropical seas of the world. First recorded from the Territory by Bequaert (1941, Occ. Pap. B. P. Bishop Mus. 16[11]: 277), from Laysan and Lisiansky. Later recorded by Pemberton (1947, "Proceedings" 13:18) from Rabbit Island (off Oahu).

Ornithoctona australasiae (F.), 1805, Syst. Antliat., 337.

Pacific area and Japan. Bequaert reports, in correspondence, "this was not before recorded by me from Hawaii. I had referred doubtfully to *Ornitheza metallica* (Schiner), the fly [in our literature] from Molokai called *Ornithomyia varipes* [Walker] by Speiser. This summer I saw this

specimen at the British Museum and discovered that it was an *Ornithoctona.*"

Ornithoica vicina (Walker), 1849, List Dipt. Brit. Mus. 4:1144. New World.

Dr. Bequaert reports, in correspondence, "This is the *Ornithoica* sp. recorded by Bryan (1921) and others. I have since seen additional specimens from Honolulu, off *Passer domesticus* and *Zosterops.*"

CORRECTIONS AND NOTES

Pseudolynchia canariensis (Macquart), 1840, Hist. Nat. Canaries, Ent., 119.

Nearly cosmopolitan in tropical and temperate regions. Change of combination and name for *Lynchia maura* Bigot (Bequaert, 1938, Ent. News 49:42). *L. maura* Bigot, 1885, is a synonym of *P. canariensis* (Macquart), 1840.

Lynchia nigra (Perty), 1833, Del. Anim. Arctic per Brasiliam 3:190. New World.

Correct name for *Olfersia acarta* Speiser, as used in our literature, according to Bequaert.

Ornithoica pusilla (Schiner), 1868, Reise der Novara Zool. 2 (1) B, Dipt: 374.

Pacific area. The correct name for *Ornithoica confluenta* var. *peroneura* Speiser, according to Bequaert.

Dr. Bequaert has kindly given me, in correspondence, the following note: "Except for the two species of *Olfersia,* found on marine birds, it would seem that all the other species are introductions by man after white man arrived. This is certainly true of *M. ovinus* and *P. canariensis,* and almost certain for *O. vicina* and *O. pusilla.* As for *L. nigra* and *O. australasiae,* they are [too] far out of their usual range to be truly native."

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Palpozenillia palpalis (Aldr.), a Tachinid Parasite of Sugar Cane Moth Borers (Castnia and Diatraea)

By HAROLD E. BOX

(MARACAY, VENEZUELA)

The writer is much obliged to Dr. F. I. van Emden, of the Commonwealth Institute of Entomology, London, for determining as *Palpozenillia palpalis* (Aldrich) several examples of a tachinid parasite which has recently been bred from *Diatraea* larvae in Venezuela and Mexico. Because of its possible importance in the biological control of sugar cane moth borers in these and other countries, it seems desirable to place on record the available information concerning this insect. The drawings illustrating this paper are the work of the writer's colleague at Maracay, Signor Pietro Guagliumi.

History and Ecology

The parasite was discovered in March 1931 by J. G. Myers, who reared it in numbers from the giant larvae of *Castnia licoides* Boisduval boring in a musaceous plant, *Heliconia bihai* L., at Wanaima, North-west District, British Guiana, just south of the Orinoco delta. Some of the flies were sent to J. M. Aldrich, who pronounced the species new to science, and who described it in 1932 (Proc. U. S. Nat. Mus., 81, art. 9, no. 2932, p. 20) under the name *Zenillia palpalis*. In 1934, C. H. T. Townsend (Rev. Ent., Rio de Janeiro, 4, p. 404) created a new genus, *Palpozenillia* Townsend, to accommodate *Z. palpalis* Aldrich.

Myers at once recognized the importance of his discovery, since at that time a specific enemy of *Castnia* was an urgent *desideratum* for the sugar plantations of Trinidad, as well as those of the British Guiana coastlands, which suffered (and so far as Trinidad is concerned, continue to suffer) severe annual loss from the ravages of this giant borer. With very limited funds available, Myers in 1935 made a first attempt to introduce *P. palpalis* into Trinidad, where D. Vesey Fitzgerald cooperated in receiving the parasite and in making urgently needed studies on its biology. The information available to the present writer on this campaign is derived from unpublished reports kindly sent to him at the time by the late Dr. Myers.

During the period June 4 to July 30, 1935, five shipments, totalling 1,600 puparia and larvae, all reared from *Castnia*, were sent by Myers from his original collecting station. Transport was by canoe and river steamer to Georgetown and thence by air. These puparia subsequently yielded 839 flies (sexes about equal) in the laboratory in Trinidad. The difference represents flies that failed to emerge (150), larvae that failed to pupate (200), flies emerging *en route* and dying deformed in the con-

tainers (92), and puparia hyper-parasitized by three species of small Hymenoptera (312), one of which was determined provisionally as *Trichopria* sp. (Diapriidae).

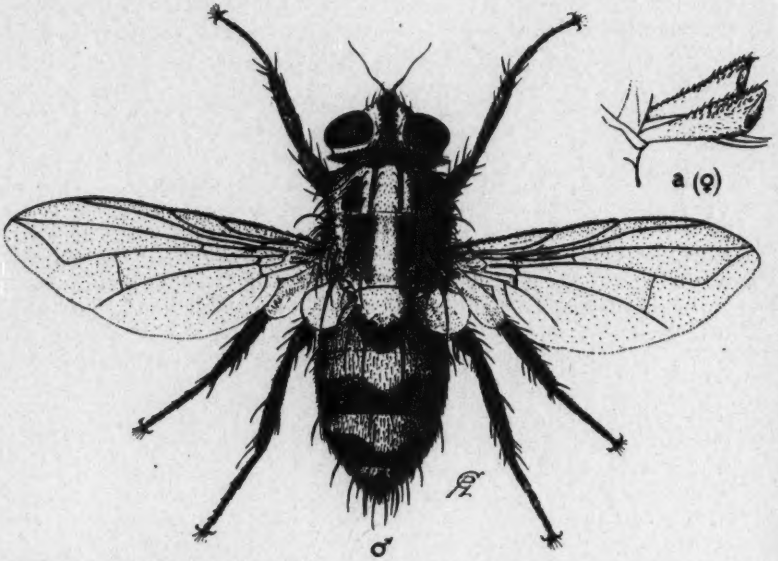


Fig. 1. *Palpozenillia palpalis* (Aldr.)
a, Palpi of female, highly magnified, showing position of sensory pits.

Due to various causes, largely administrative by nature, but also because of the difficulty inherent in attempting to multiply a parasite before the essentials of its life history were known, this first experiment at introducing *Palpozenillia* to civilization was not successful. Beyond the liberation of some of the flies originally imported and the tiny stock of those which had been reared at the cost of much effort in the laboratory, a total of 170 in all, into suitable areas of sugar cane and *Heliconia* heavily infested with *Castnia* larvae, no further attempt was made to exploit the possibilities of this exceedingly promising parasite. It would not be correct, however, to state that *Palpozenillia* was given a fair trial under Trinidad conditions and had failed, thereby conceding another scalp to those who collect and publish records of parasite failures. Nevertheless, during the brief life of the campaign several interesting facts concerning the biology of the parasite were elucidated, and these are incorporated below.

P. palpalis was rediscovered by the present writer in the sub-Andine region of Venezuela in April, 1948. When investigating an interesting new species of *Diatraea* (since described as *D. andina* Box) whose large larvae inhabit the mountain grass, *Pennisetum peruvianum* Nees, near

the village of Guarico, on the watershed of the rivers Guarico and Chabasquen (altitude 1250 meters), close to the boundary of Lara and Portuguesa States, puparia of an unknown tachinid were found in the borer tunnels, and later others developed from the borers collected. Flies were reared from them, and part of the series was determined by van Emden as *Zenillia palpalis* Aldr. Since then, the tachinid has been found on several other occasions in the same locality, which is evidently a permanent breeding ground for it.[1] During March and May, 1951, the average parasitism in larvae of *D. andina* was approximately 50 per cent by *Palpozenillia,* with an occasional example of parasitism by an undescribed *Agathis* (*Microdus*) sp. (Braconidae).

On March 15, 1949, one parasitized larva of *Diatraea canella* Hampson was collected in young sugar cane in a newly established farm in cleared forest at Guanare, Portuguesa State (altitude 180 meters); on March 28 it yielded nine puparia, from which flies emerged between April 8 and 11; they were identified by van Emden as *Z. palpalis.*

It was impossible not to recognize the potential value of a parasite so adaptable that it could maintain itself in the hot steamy jungle of the Orinoco delta, in larvae of *Castnia,* yet also in the cool highlands of sub-Andine Venezuela, in larvae of *Diatraea,* with indications that it might be utilizable for the biological control of two major pests of sugar cane, *viz. C. licoides* and *D. canella.* During 1951, therefore, some preliminary studies were undertaken in our laboratory at Maracay (altitude 450 meters), using material from Guarico, and our results are incorporated in the text below as well as in the figures illustrating this paper.

In October, 1950, L. C. Scaramuzza visited the sugar cane areas of western Mexico, and included in his itinerary a stop at Tepic, Nayarit State (altitude 900 meters), with the object of looking for a *Diatraea* parasite that had been reported from there by R. H. Van Zwaluwenburg in 1926 (Journ. Econ. Ent., 19, p. 667). This had been identified by Aldrich as *"Phorostoma* sp." from a specimen reared by T. E. Holloway from *Diatraea* in sugar cane at Tepic in 1923, and which is still preserved in the U. S. National Museum. The writer is grateful to Curtis W. Sabrosky for tracing this specimen at Washington, and for the information that he identifies it as the well known *Diatraea* parasite, *Paratheresia claripalpis* (Wulp) (originally described from Chilpancingo, Guerrero, Mexico)[2]; this specimen is labelled *"Phorostoma* n. sp." in Aldrich's ms. However, Scaramuzza's search at Tepic was by no means unsuccessful, for he not only found *Paratheresia* (which he recognized and noted as such) attacking *Diatraea,* but he also discovered another dipterous parasite there, which he naturally concluded (as did the present writer later) must obviously be the *"Phorostoma* sp." reported from that locality by Van Zwalu-

[1] Although *D. andina* has been found at several other places in western Venezuela (in Mérida and Táchira States), at altitudes from 1,150 to 1,850 meters, in stalks of *Pennisetum peruvianum* and *P. bambusiforme* (Fourn.) Hemsl. (Box 1951, Bull. Ent. Res., 42, p. 394), the only locality where the larvae have been found parasitized by *P. palpalis* is the one named above.

[2] Mr. Sabrosky communicates that the U. S. National Museum has another specimen of *P. claripalpis,* examined and labelled as *"Phorostoma* n. sp." by Aldrich; its provenience is "Colima, Mexico, Aug. 1923 (Van Zwaluwenburg)" and it is undoubtedly the basis of Van Zwaluwenburg's observation (*l.c.*), when he discusses the *"Phorostoma* sp.": ". . . and we have seen what is probably the same species farther south in the State of Colima."

wenburg. He very kindly sent two reared specimens to the writer, and these have been examined by van Emden and identified as *Palpozenillia palpalis* (Aldr.). When the present writer visited Tepic in March, 1951, residual (empty) puparia of *Paratheresia* were very common in old borer tunnels in almost every field of cane ready for harvest, and two puparia (one residual and one from which the adult fly had failed to emerge) of *Palpozenillia* (believed at the time to be "*Phorostoma* sp." and referred to as such in the writer's report[3]) were found in one dead-heart in a field of young ratoons which had recently suffered from frost damage. The host of the parasite in this region is *Diatraea considerata* Heinrich, the most widespread and injurious sugar cane borer in Nayarit and southern Sinaloa.

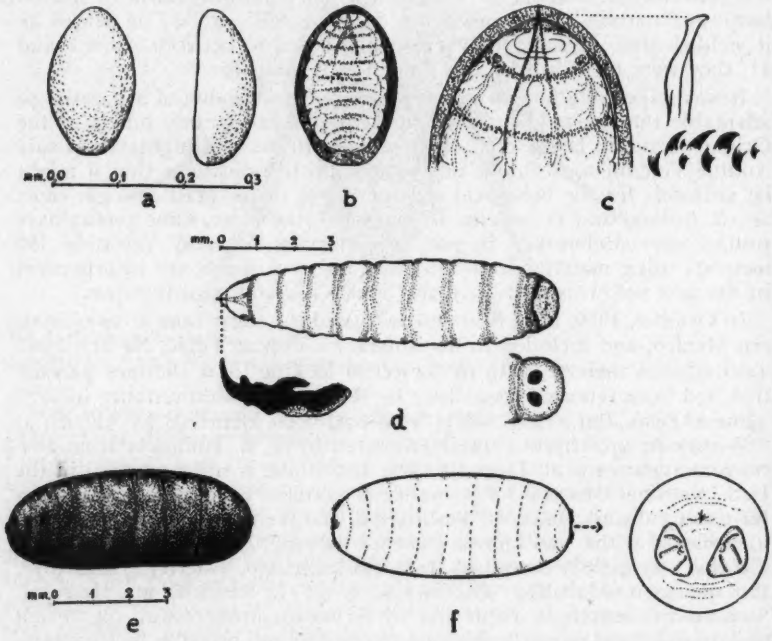


Fig. 2. *Palpozenillia palpalis* (Aldr.)
a, Egg; b, Egg at maturity, showing larva inside; c, Details (magnified) of embryonic larva; d, Mature larva; e, f, Puparium (at right: spiracular group, magnified).

Thus we have confirmation of the extraordinary adaptability of this tachinid and further evidence that climatic factors *per se* are not necessarily of such prime importance as has been supposed in determining the

[3] Informe Preliminar sobre los Barrenadores o "Borers" de la Caña de Azúcar (*Diatraea, Chilo*) en México, a base de un Viaje de Reconocimiento efectuado durante marzo-abril, 1951, a las Regiones Cañeras: I—Sinaloa, II—Nayarit, y XIV—Huasteca; con observaciones complementarias. Unión Nacional de Productores de Azúcar, México, D. F., 92 pp., 1951.

establishment of a dipterous parasite[4]. It would indeed be difficult to imagine "general ecological conditions" more contrasting than those of the equatorial swamp-forest region of north-western British Guiana, and those of the parched xerophytic surroundings of Tepic, Mexico, where there may be sharp frosts during the winter months.

The foregoing records of *P. palpalis* may conveniently be summarized, as follows:

Locality	Host Insect	Food Plant of Host Insect
British Guiana: N.-W. District (near sea-level)	*Castnia licoides*	*Heliconia bihai*
Venezuela: Guanare, Portuguesa (180 m.)	*Diatraea canella*	Sugar Cane
Venezuela: sub-Andine region near Guarico, Lara-Portuguesa (1,250 m.)	*Diatraea andina*	*Pennisetum peruvianum*
Mexico: Tepic, Nayarit (900 m.)	*Diatraea considerata*	Sugar Cane

Description[5] of the Tachinid and Notes on its Biology.

The adult fly (fig. 1) is bristly, with the typical tachinid appearance. Eyes dark reddish; front and sides of head with a bright bronze-golden sheen. Thorax and abdomen similarly bronze-golden, conspicuously marked with longitudinal stripes on the thorax and broad transverse bars on the abdomen. Legs black; wings transparent. Characteristic of the species—and whence both the generic and specific names are derived—is the "peculiar depression, or perhaps a sensory pit" (Aldrich) at the apex of the palpus in the female (fig. 1, a), apparently not found elsewhere in this group of Diptera. The flies vary much in size, depending on the number maturing in an individual host. Small specimens are 4.5 mm. long with wing expanse 9.5 mm.; the largest we have seen is 7.5 mm. long with wing expanse 15.5 mm.; normal specimens are about 5.5 mm. long with wing expanse 12.0 mm. These measurements are based on our series from *Diatraea* spp. in Venezuela and one of Scaramuzza's specimens from Mexico. Aldrich gives 8-9 mm. as the length of the type specimens (reared from *Castnia*).

The egg and post-embryonic larva are minute by comparison with those of *Lixophaga*, *Metagonistylum* and *Paratheresia*. The egg is ovoid, somewhat flattened on one side, and measures 0.22 mm. x 0.112 mm. Eggs laid in glass vials appear glistening pearly-whitish. Larvae dissected from mature eggs (in salt solution) are similarly ovoid; they are very slow of movement.

To obtain mated pairs of flies in captivity, rather large cages are best; those used in the Trinidad campaign were cylindrical, 1.85 m. high x 1.0 m. diameter; a dark green mosquito net proved the most suitable covering. Inside the cage is placed a quantity of cane (or parts of *Heliconia* plants) infested with *Diatraea* (or *Castnia*) larvae. The cages need to be kept constantly humid. The flies feed avidly on sweetened water or freshly expressed cane juice. Mating occurs during early morning hours. The fly is oviparous, but we have not actually observed the act of oviposition; Fitzgerald noted that eggs were laid in the "frass" excreted by the host larva outside its tunnel. The minimum gestation period was calculated to be 10 days, with a possible maximum of 14 days, at Maracay. Eggs

[4] As was stressed by the writer in a paper, "Some Considerations upon the Dipterous Parasites of the Sugar-cane Moth Borer, *Diatraea saccharalis* (Fabr.)", read at the 25rd Annual Conference of the *Asociación de Técnicos de Cuba*, Habana, November 1949 (see *Proceedings*, pp. 17-27).

[5] The descriptive notes are intended as a general aid for the field worker and not as a technical description of the insect.

dissected from gravid females and kept in a suitable atmosphere (or floating in salt solution) remain alive for more than two weeks without hatching. Fitzgerald noted how extraordinarily slow is the development of the parasite larva in *Castnia,* and that it may remain in its first instar within the host for as long as 20 days; in one experiment, 72 days elapsed between the date of oviposition and the emergence of adult flies. In Venezuela, using *D. canella,* conditions were more normal, and in one instance where the life-cycle was completed in a cage experiment, flies (two) emerged 25 days after the host larvae had been exposed to attack; in this case the duration of the pupal period is known to have been 12 days. In Trinidad, the pupal period was estimated to be 20 days; in Venezuela, 21 days was the period noted for field-collected parasites from *D. andina.*

A fertile female usually contains from 600 to 800 eggs in the ovisac. In the field, 40 flies were reared by Myers from one individual *Castnia,* and in the laboratory the maximum number reared from one *Castnia* larva was 52. In Venezuela, 9 parasites emerged from one larva of *D. canella* collected from sugar cane, while 13 have been reared from one larva of *D. andina* in *Pennisetum.* The writer is informed that as many as 15 parasites have been bred from a single larva of *D. considerata* from sugar cane in Mexico.

New Sciaridae from the Hawaiian Islands (Diptera)

FRANK R. SHAW

UNIVERSITY OF MASSACHUSETTS

Through the kindness of Dr. D. Elmo Hardy I have been able to examine the Sciaridae from the collection of the University of Hawaii. Previously only a single species of the genus *Sciara* had been reported from this area, *Sciara molokaiensis* Grimshaw. Through the kindness of Dr. Alan Stone, U. S. National Museum, I am able to include Grimshaw's description of this species. The most valuable source of reference for the determination of the Hawaiian species proved to be the key prepared by Edwards (1928) (see list of references).

Since the latest revision of the supra-specific categories of this family is that of Frey, all specimens were determined to their correct group in Frey's keys. All material was found to fall in the genus *Lycoriella* of Frey. However, I do not agree with Frey's concepts of this group in this respect and shall treat, at present, *Lycoriella* as a subgenus of *Sciara*.

The following key to the Hawaiian species is based largely upon color characteristics. Such a key should be considered as being only provisional. For accurate species determination, male genitalia seem to be the most reliable criterion.

Key to Species of Sciara of Hawaii

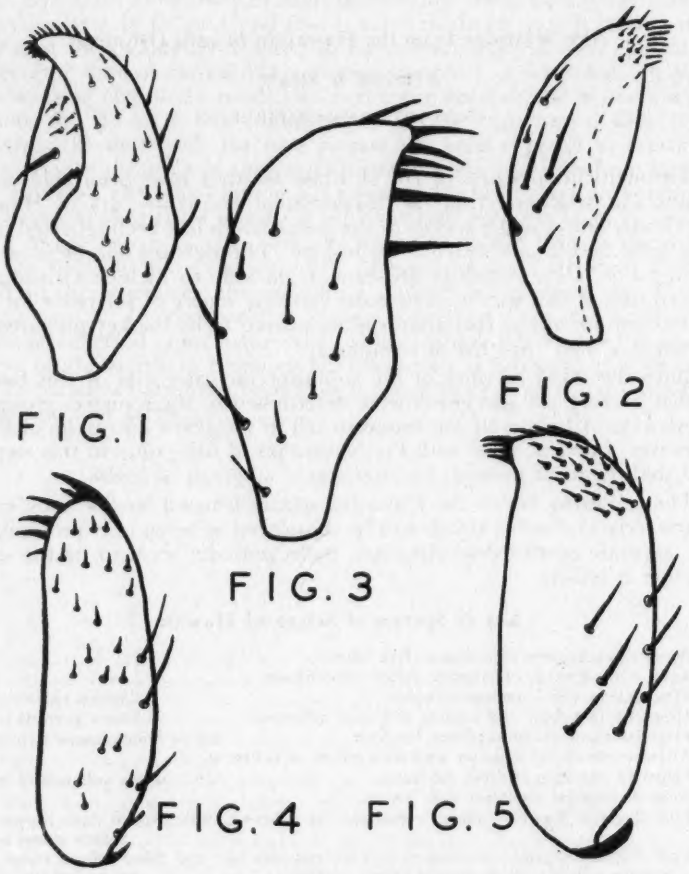
1. Basal two segments of antenna dark brown 2
   Basal two segments of antenna yellow or ochreous 3
2. Mesoscutum black, abdomen brown ..... **Sciara hardyi** n. sp.
   Mesoscutum yellow and brown, abdomen ochreous ..... **Sciara garretti** n. sp.
3. Flagellar segments of antennae blackish ..... **Sciara molokaiensis** Grimshaw
   At least one of the flagellar segments yellow or ochreous 4
4. Flagellar segments entirely ochreous ..... **Sciara johannseni** n. sp.
   Some of flagellar segments dark brown 5
5. First flagellar segment yellow, remainder dark brown, mesoscutum dark brown ..... **Sciara stonei** n. sp.
   First flagellar segment and apical half of segments two and three yellow, mesoscutum yellow with W-shaped brown pattern ..... **Sciara laffooni** n. sp.

Grimshaw's description of *Sciara molokaiensis* is included for completeness so that later workers will have available in one paper the descriptions of all Hawaiian species of the genus *Sciara*.

Sciara molokaiensis Grimshaw.

Grimshaw, "Fauna Hawaiiensis," 3:2, 1901:

"♀ Long. corp. 1½ mm.; al. 2½ mm. Antennae blackish, joints of scape lighter, those of flagellum sessile, twice as long as broad. Head black, palpi yellow. Thorax black, shining, humeri yellowish, pleurae yellowish, but dark above the intermediate coxae, halteres yellowish with dark club. Abdomen reddish-brown, hind borders of the seg-



EXPLANATION OF FIGURES

(Male claspers)

1. Ventral view of right clasper of *Sciara johannseni* n. sp. 2. Ventral view of left clasper of *Sciara hardyi* n. sp. 3. Ventral view of clasper of *Sciara garretti* n. sp. 4. Ventral view of right clasper of *Sciara laffooni* n. sp. 5. Ventral view of right clasper of *Sciara stonei* n. sp.

ments, especially of the apical ones, darker, venter yellow. Legs pale, all the coxae and femora yellow, the latter with a black spot at the extreme base, tibiae yellowish with the spurs conspicuous and whitish, tarsi brownish, becoming darker towards the tip. Wings greyish hyaline, costal and first and third longitudinal veins darker and stronger than the rest, first longitudinal vein ending at half the length of the wing, before the base of the fork and opposite the tip of the sixth vein; distance between the tips of the first and third veins four times that between the tip of the third vein and the termination of the costal; anterior branch of the fork ending midway between its posterior branch and the tip of the third vein; termination of the fifth vein midway between the posterior branch of the fork and the sixth vein; furcation of fifth and sixth veins near the base of the wing and considerably before the origin of the anterior cross vein.

"Hab. Molokai Mts., 6500 ft., September 1893, one female."

Sciara (Lycoriella) johannseni n. sp.

Male. Length 2.25 mm. General color dark brown.

Head: Vertex and occiput dark brown. Compound eyes hairy, eye-bridge complete. Ocelli three, yellowish in color. Antennae sixteen-segmented. First two segments yellow, remainder uniformly ochreous with silvery pile. Mouthparts ochreous.

Thorax: General color dark brown. Mesoscutum dark brown laterally and posteriorly. Disk of mesoscutum yellow. Humeri yellow. Dorsocentral bristles strong, black. Scutellum brown, four scutellar bristles. Pleura reddish brown. Wing 1.75 mm. long. Veins yellowish. Costa extends about 0.75 the distance from R_{4+5} to M_{1+2}. Only the radius with macrotrichia. R_{1+2} ends before the fork of M. Petiole of cubitus about 0.7 as long as basal section of media. Halteres have yellow petiole and dark brown knob. Legs yellow, under surface of trochanters with black stripes. Spurs of meso- and metathoracic tibiae subequal in length.

Abdomen: Dark brown, the hypopygium somewhat paler. Dististyle (figure 3) with a median lobe on the ventral surface. Tip of dististyle with many small black setae. Two strong setae on mesal surface of dististyle.

In Edwards' (1928) key this species would run to couplet 47. It is not *Sciara leucocera* Kieffer. It resembles somewhat *Sciara garretti* n. sp. but differs in regard to the color pattern of the thorax and in the structure of the dististyle.

I take pleasure in naming this species for Dr. O. A. Johannsen, the dean of the American workers in this group.

Described from two males taken on the island of Oahu, December 10, 1913. Type in my collection, paratype in collection of the University of Hawaii.

In addition a specimen closely allied to *S. johannseni* was taken in March, 1951, in Honolulu by D. Elmo Hardy. The genitalia are very similar to those of *S. johannseni*. However, the color pattern of the thorax resembles more closely that of *Sciara laffooni* n. sp., but differs in the details of the markings of the mesoscutum. The specimen does not seem to warrant description as a new species. At this time I regard it as an atypical variety of *Sciara johannseni*.

Sciara (Lycoriella) hardyi n. sp.

Male. Length 1.75 mm. General color black.

Head: Vertex and occiput black. Lower surface of head and mouthparts somewhat paler. Compound eyes hairy. Eye-bridge complete. Ocelli three, light brown. Antennae sixteen-segmented. Basal two segments dark brown, flagellum ochreous.

Thorax: General color black, shining. Dorsocentral bristles strong, black. Scutellum black, four scutellar bristles. Wing 1.5 mm. long. Veins yellowish. Costa extends about 0.7 distance from R_{4+5} to M_{1+2}. Subcosta short. R_{1+2} ends proximad of fork of M. Petiole of cubitus about 0.7 as long as the basal section of M. Petiole of haltere whitish

yellow, knob black. Legs yellow, ventral surface of trochanters with black stripe. Tibial spurs yellow, those of meso- and metathorax subequal in length.

Abdomen: Brown, each segment somewhat darker apically. Dististyle (figure 2) brown, concave distally. Has approximately eight strong setae on mesal surface and two subapical setae. In addition a tuft of smaller setae near tip on ventral surface.

In Edwards' (1928) key this species would run to couplet 44. It does not agree with the description of *Sciara niveiapicalis* Brunetti. My species lacks the characteristics given in the second half of the couplet in that the costa extends more closely to M_{1+2}. The hypopygium resembles somewhat that of *S. modesta* Staeger as figured by Lengersdorf.

I take pleasure in naming this species for Dr. D. Elmo Hardy, whose interest in the Diptera has been most helpful.

Described from one male taken at a light trap in Honolulu, Oahu, January 25, 1951 by B. L. Defibaugh. Type in my collection.

Sciara (Lycoriella) garretti n. sp.

Male. Length 2 mm. General color reddish brown.

Head: Dark brown including the mouthparts. Compound eyes hairy, Eye-bridge complete. Ocelli three, yellowish brown. Antennae sixteen-segmented. Antennae dark brown with silvery pubescence.

Thorax: General color ochreous to reddish. Mesoscutum yellow with a brown stripe on each side and a brown, tripartate pattern in the center. Ground color between the tripartate stripes yellow. Dorsocentral bristles strong and black. The scutellum is dark brown and has four scutellar bristles. Pleura brown above and pale yellow below. Wing 1.5 mm. long. Veins yellowish. Costa extends about 0.7 the distance from R_{4+5} to M_{1+2}. Subcosta short, ends free. R_{1+2} ends proximad of fork of M. Radius with macrotrichia. Petiole of cubitus about 0.8 the length of the basal section of M. Halteres have yellow petiole and brown knob. Legs yellow, appearing somewhat darker apically. Trochanters with black stripe on ventral surface. Tibial spurs yellow, those of meso- and metathorax subequal in length.

Abdomen: Brownish yellow. Dististyle (figure 3) yellow with brownish apex. Two subapical setae and a strong apical seta. In addition there are about 5-6 setae on the mesal surface. There are about 25-30 small setae toward the apex of the clasper.

In Pettey's key this species would run to couplet with *Sciara* (*Neosciara*) *luteola* (Pettey). In Edwards' (1928) key this species would run to couplet 47. It does not agree with the description of *S. leucocera* Kieffer on the basis of the color of the antenna. In some respects it resembles my *Sciara johannseni,* but the structure of the hypopygium differs.

I take pleasure in naming this species for C. B. D. Garrett who has described many new species of Nematocera from British Columbia.

Described from two males collected on the island of Oahu, December 10, 1913. Type in my collection, paratype in collection of University of Hawaii.

Sciara (Lycoriella) laffooni n. sp.

Male. Length 2 mm. General color dark brown and yellow.

Head: Vertex and occiput dark brown. Mouthparts ochreous. Compound eyes hairy. Eye-bridge complete. Antennae sixteen-segmented. First three segments and apical half of segments four and five, yellow. Remainder of antennae dark brown with short, silvery pile. Flagellar segments not noticeably petiolate.

Thorax: General color brown and yellow. Mesoscutum has yellow humeri. Lateral edges, dark brown. At the posterior portion of the mesoscutum a dark brown band which extends anteriorly a distance subequal to the length of the scutellum. Extending anteriorly from dark band at the rear of the scutum is a more or less W-shaped dark

brown pattern which encloses three yellow areas. Dorsocentral bristles strong, black. In addition, this species has a pair of strong setae on the lateral margin of the scutum between the humeri and the wing-bases. Scutellum dark brown with four marginal setae. Pleura dark brown above, yellow below. The two areas subequal in size. Wing 1.75 mm. long. Veins yellow. Costa extends about 0.7 the distance from R_{4+5} to M_{1+2}. Subcosta short, ends free. Radius with macrotrichia. R_{1+2} ends before fork of M. Petiole of cubitus about 0.66 the length of the basal section of M. Petiole of haltere yellow, the knob dark brown. Legs yellow, trochanters with black stripe, ventrally. Spurs of meso- and metathoracic tibiae subequal in size.

Abdomen: Dark brown except for hypopygium which is yellowish. Clasper (figure 4) with one strong apical seta and three equally strong setae on apical mesal surface. In addition, a pair of smaller setae. Base of clasper with a hook-like process. The clasper resembles somewhat that of *Sciara lapponica* Lengersdorf.

This species would run to couplet with *Sciara ocellaris* Comstock in Pettey's key but differs in regard to structure of hypopygium. In Edwards' (1928) key this species would run to couplet 47. It does not agree with either of the two categories listed there. Superficially, it resembles my *S. johannseni* but the structure of the clasper is wholly distinct.

Described from two males from light trap January 25, 1951 in Honolulu by B. L. Defibaugh. Type in my collection, paratype in collection of the University of Hawaii.

I take pleasure in naming this species for Jean Laffoon who is currently monographing the North American species of *Mycetophila.*

Sciara (Lycoriella) stonei n. sp.

Male. Length 2 mm. General color, dark brown-black.

Head: Vertex and occiput black. Compound eyes hairy. Eye-bridge complete. Ocelli three, brown. Antennae sixteen-segmented. First three segments yellow, remainder dark brown with silvery pubescence. Flagellar segments petiolate. Maxillary palpi yellow.

Thorax: Mesoscutum dark brown, pollinose. Dorsocentral bristles strong, black. Scutellum dark brown with four marginal bristles. Mesopleura somewhat paler than notum. Wing 2 mm. long. Veins yellow. Costa extend about 0.7 distance from R_{4+5} to M_{1+2}. Subcosta short, ends free. Radius with macrotrichia. R_{1+2} ends before fork of M. Petiole of cubitus about 0.6 as long as basal section of M. Basal half of petiole of haltere white, remainder of haltere black. Legs yellow. Tibiae and tarsi infuscated. Trochanters with a ventral black stripe. Spurs of meso- and metathorax yellow, subequal in size.

Abdomen: Dark brown, venter somewhat paler. Dististyle (figure 5) dark brown with four stout setae at apex. Base of dististyle with a peculiar hook-like structure.

In Edwards' (1928) key this species would run to couplet 45. It differs from *Sciara politula* Edwards in having two spurs on the meso- and metathoracic tibia. It differs from *S. nitidithorax* Brunetti in the color of the antennae, in having the mesoscutum pollinose and in the color of the haltere, legs and abdomen.

This species is described from seven males taken at light traps in January 1951 by D. E. Hardy and B. L. Defibaugh in Honolulu, Oahu.

I take pleasure in naming this species for Dr. Alan Stone of the U. S. National Museum. Type and two paratypes in my collection. Remainder of paratypes in collection of the University of Hawaii.

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Infestation Norms for Dacus cucurbitae in Momordica balsamina, and Seasonal Differences in Activity of the Parasite, Opius fletcheri[1]

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In February, 1950, the first releases of a newly introduced opiine parasite of *Dacus cucurbitae* Coquillett were made on the island of Oahu, Territory of Hawaii. This parasite, now known as *Opius watersi* Fullaway, 1951, had been found in Bareilly, United Provinces, India, in the course of explorations for parasites of *Dacus dorsalis* Hendel. In breeding tests conducted by the Bureau of Entomology and Plant Quarantine in Honolulu, and also in pilot and mass breeding by the Territorial Board of Agriculture and Forestry, it showed considerable promise, and more than 115,000 parasites were bred and released throughout the Territory during 1950 (data from records of the Territorial Board of Agriculture and Forestry).

In order to check on the effectiveness of this parasite in the event it should become established, it was felt desirable to measure the relative abundance of *Dacus cucurbitae* before and after establishment. There are several ways that this can be done, but the method finally decided upon was to measure the larval infestation in *Momordica balsamina* Linnaeus, a wild cucurbit that grows abundantly in many parts of the Hawaiian Islands. It was thought that any significant reduction in the level of *Dacus cucurbitae* would be reflected in a lowered infestation level in the various hosts. Commercial crops such as cucumbers and tomatoes were excluded from consideration since cultural practices vary so greatly, producing correspondingly great variations in infestation.

Unfortunately, *Opius watersi* has not yet become established in the Territory, but the data obtained are published here in order to present an up to date picture of infestation by *Dacus cucurbitae*. With the continuing interest in biological control of fruit flies, there is still the possibility that a parasite may be found which will supplement the work of *Opius fletcheri* Silvestri to such an extent that a further reduction in abundance of the melon fly may be brought about. In such an event, these data would provide a valuable standard for comparison of infestation before and after introduction. Furthermore, this study revealed a pronounced seasonal difference in activity of *O. fletcheri*, a fact of considerable intrinsic interest which apparently has not been realized previously, and the results of the studies on parasitism are also presented here. *O. fletcheri* was introduced into Hawaii in 1916, and is a well established parasite (Willard, 1920).

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[2] The last-named author is now with the Territorial Board of Agriculture and Forestry, Honolulu, T. H.

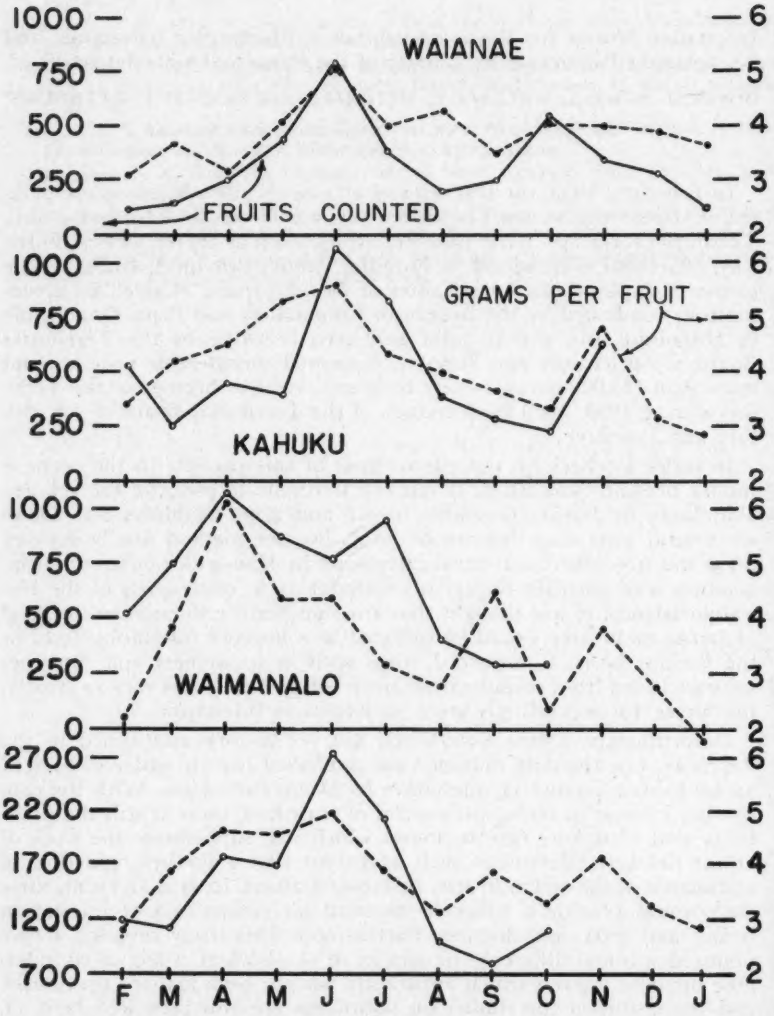

Fig. 1. Host fruit production factors. Number of *Momordica* fruits and average weight per fruit for each locality and for the three localities combined. The bottom graph is based on either the total (number) or average (weights) of the three values in the upper graphs.

METHODS

Fruit collections were made at fixed points near Waianae (Makaha Valley), Kahuku (near the air strip), and Waimanalo, all three localities on the island of Oahu. At each locality, from four to six stations were sampled. The five stations near Kahuku were laid out along a road and in direct continuity with one another. The four stations near Waianae were in two groups of two each, the groups being about a mile apart. The six at Waimanalo were scattered over an area approximately one mile long and one-third of a mile wide. The same stations were sampled throughout the year as much as possible, although several changes were required as a result of clearing or burning by growers, especially in the Waimanalo area. Most of the stations were roadside patches ranging in length from 100 to 350 feet, although three of those in Makaha Valley were of the order of 1000 feet long. Fruits were collected once a month. Mature orange or yellow fruits were gathered when possible, but almost always there were a few green-yellow or even green-white fruits included in the sample. Broken fruits were avoided as much as possible. All fruits seen at the time of sampling were counted, even those which had just recently dropped the petals. The sample usually comprised one-third to one-half of the fruits counted. In the laboratory, weight and number of stings were recorded for each sample, and the larvae were removed from the fruits. The larvae were reared on diced pumpkin in a manner described elsewhere (Newell *et al.*, 1951). The dissected fruits were then kept in a jar or pan, depending on the size of the sample, and were examined each day until no further recoveries of larvae were made.

When emergence of flies and parasites was complete, the puparia were checked, and any unemerged individuals were added to the totals. Occasionally the chalcid *Tetrastichus giffardianus* Silvestri was encountered, and this necessitated a close examination of the puparia for the characteristic exit hole of this species, for three to ten adults may emerge from a single puparium. For the purposes of this study, each puparium from which *Tetrastichus* emerged was counted as a single *O. fletcheri,* since the development of *T. giffardianus* in *D. cucurbitae* requires the presence of *O. fletcheri* (Pemberton and Willard, 1918). The data are presented in tables 1 to 4.

ABUNDANCE OF HOST FRUIT

Momordica balsamina bears fruit throughout the year, although more abundantly during the months of April to July. In 1951, maximum production came in June in the Waianae and Kahuku areas, but at Waimanalo more fruits were found in April than in any other month. At all three localities, the time of maximum fruiting coincided with the time of greatest fruit size (fig. 1). The curve for abundance of *Momordica* generally parallels the total production of the principal commercial hosts of *Dacus cucurbitae* (table 5). There was no positive indication that any seasonal trends in fly or parasite activity which were measured here were significantly influenced by the quantity of host material available, although it is quite possible that certain of the differences between locali-

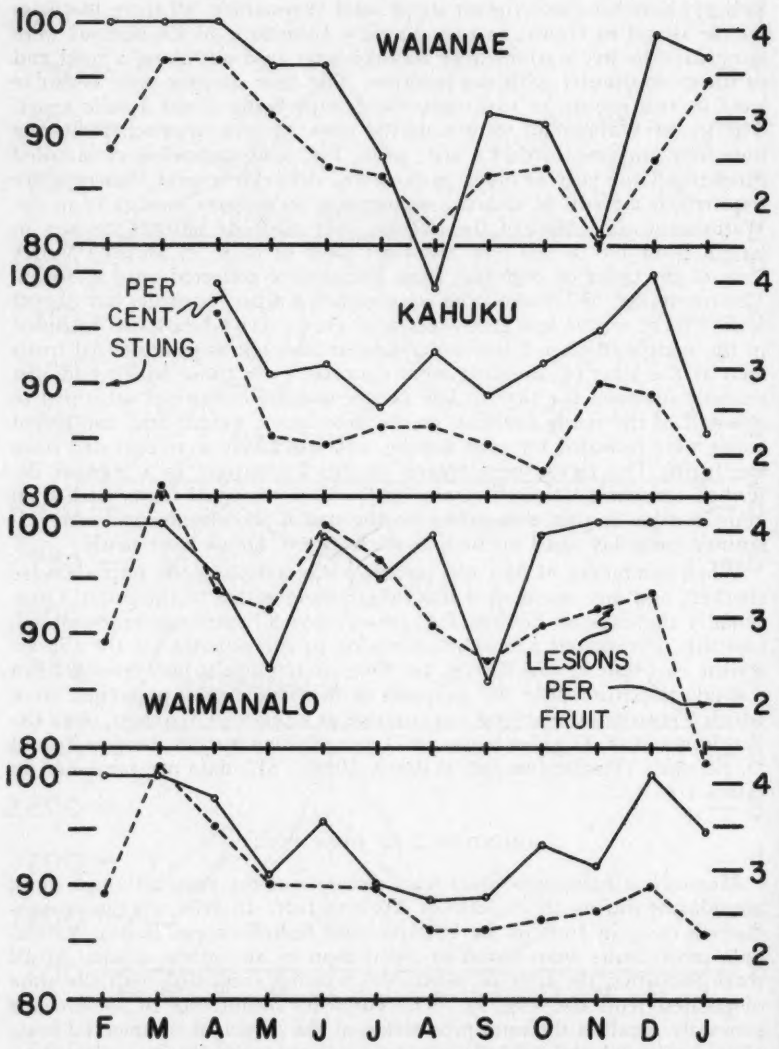

Fig. 2. Egg lesions per fruit and per cent of fruits stung at each locality. The bottom graph is based on the average of the three (or two) values in the upper graphs.

ties were associated with the factor of host abundance. For example, the infestation averaged 3.1 and 3.4 larvae per fruit for the 12 monthly collection periods at Waianae and Kahuku respectively, but 4.0 per fruit at Waimanalo, one of the chief truck crop centers on the island. Yet, the average infestation per *Momordica* fruit at these three localities during the peak period of production of commercial hosts (April through August) was 3.1, 3.4, and 4.1 respectively, compared with 3.1, 3.2 and 3.9 larvae per fruit for the seven remaining months. Thus, while the higher infestation at Waimanalo may possibly have been a consequence of the greater abundance of host material there, no seasonal differences in infestation could be associated with this factor.

Truck cropping at Waianae was at a very low ebb throughout most of the time this study was in progress, owing to financial reverses of the growers. The previous season's crop (1949) had been fairly heavy, and plantings were increasing during the last two or three months of 1950. There were no commercial plantings of cucurbitaceous or solanaceous crops within several miles of the Kahuku locality. Here the cultivated land is planted exclusively to sugar cane, except for a few home gardens.

OVIPOSITIONAL ACTIVITY AND LARVAL INFESTATION

The per cent of stung fruits dropped noticeably during the summer months, and the number of lesions per fruit also dropped slightly, although the latter was not significant statistically. Nevertheless, in conjunction with the seasonal variations in the other factors, it seems likely that the trends in both curves are real. But because of the differences in fruit abundance from month to month, it is impossible to conclude that these trends alone indicate lowered ovipositional activity on the part of the flies. However, an index of the total number of lesions in each area can be derived by multiplying the number of fruits counted by the number of stings per fruit, and when this is done (fig. 2), a curve is obtained which has a June maximum 3.9 times as great as the September minimum. The rest of the curve conforms to what one would expect if there were a drop in ovipositional activity of the fly population beginning in July.

The curve for larval population parallels the one for egg lesions, but is somewhat higher except in October. The June maximum is 4.8 times as high as the October minimum.

The mean value for the twelve monthly collections at Waianae was 3.1 larvae per fruit, while at Kahuku and Waimanalo it was 3.4 and 4.0 larvae per fruit, respectively. Infestation maxima occurred in March and December when all three localities combined averaged over 4.5 larvae per fruit, compared with the minimum of 2.2 larvae per fruit in October. From the foregoing account, it will be evident that larvae per fruit is not in itself a good indicator of ovipositional activity because of seasonal differences in fruit abundance, although it probably provides a good index of relative fly abundance when collections are made over a period of a year.

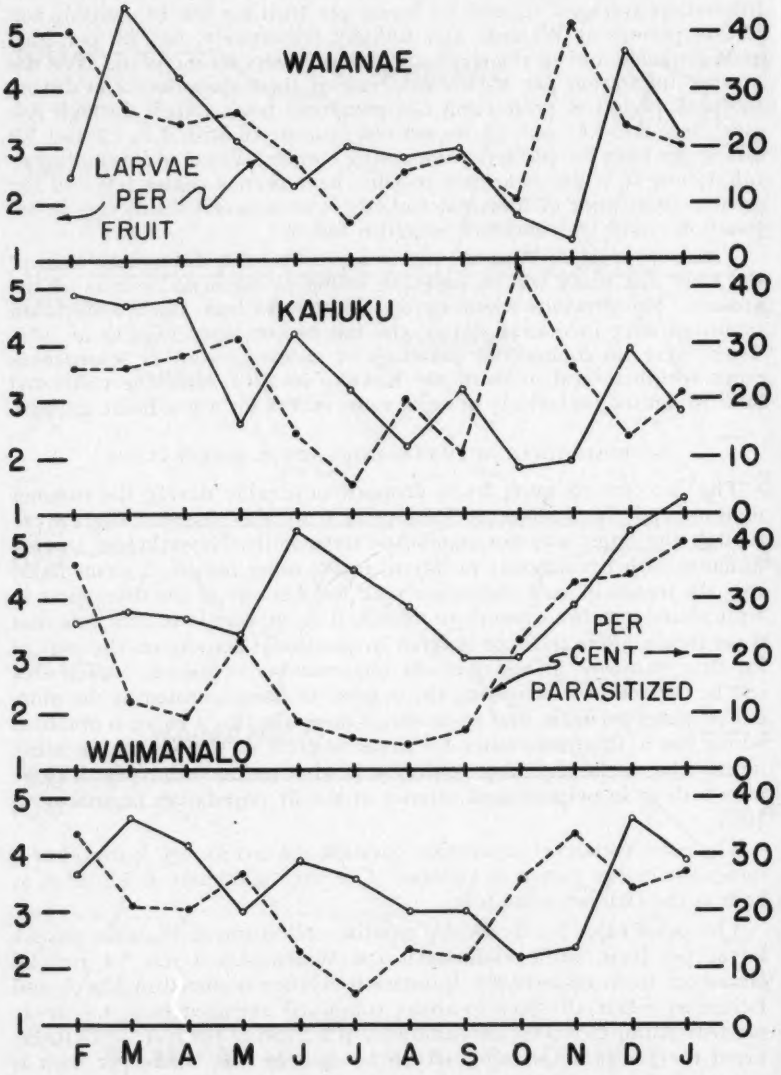

Fig. 3. Larval infestation per fruit and per cent of larvae parasitized at each locality. The bottom graph is based on the three values in the upper graphs.

INCIDENCE OF PARASITISM

In considering the data on incidence of parasitism by *Opius fletcheri,* it is important to keep in mind the method of larval recovery used in this study. The larvae removed from these fruits were in all stages of development at the time the fruits were picked. Since *O. fletcheri* oviposits chiefly in the second or third instar larvae, and probably not at all in the eggs, many of the individuals present in the fruits had never been subjected to parasitism. Therefore, the results obtained by this method are not comparable with the results obtained when only the more mature larvae are used. Nevertheless, there is no reason to believe that the proportion of the population exposed to parasitism should show any marked seasonal variations resulting from the methods used.

A study of figure 3 will show that there was a pronounced depression in the degree of parasitism at all stations during the months of June, July, August, and September. An analysis of variance of the per cent parasitism for the twelve months of the year gave an l.s.d. value (least significant difference) of 16.3 which is significant at the 19:1 level, and 23.0 at the 99:1 level. There was no statistically significant difference between any of the three localities. The question now arises, was this depression due to a real decline in numbers or activity of parasites, or was it a reflection of some change in the number of host larvae? A very large and sudden increase in the larval population, with no corresponding change in the parasite population could, conceivably, result in just such a drop in parasitism as we see here. Using the figures for fruits counted, larvae per fruit, and per cent of larvae parasitized, it was possible to obtain estimates of the relative numbers of fly and parasite larvae in the populations sampled. While these are only approximations, the seasonal differences were considerable and probably real. Figure 4 shows the number of larvae available for oviposition, and the number of larvae attacked by *Opius fletcheri.* From the latter curve, it can be seen that there was a marked drop in the activity of the parasite population during the months of July, August, and September, at which time the incidence of parasitism was also at its lowest point. Parasite activity increased in October and this trend continued unchecked into November at both Kahuku and Waianae, and into December at the latter locality. Difficulties in sampling due to disturbance of several of the areas made it impossible to continue the comparison into these months, however. From figure 4 it is evident that the drop in per cent of larvae parasitized (fig. 3) was in no way the result of an increase in number of available larvae; in fact, it actually coincided with a drop in the number of host larvae. Therefore, it seems evident that there was a real decline in the activity of the parasite population during the summer months.

Turning now to the matter of the decline in larval abundance, it can be seen that this began in June or July and continued unchecked until October (and probably November). It would seem reasonable to suppose that maximum emergence of larvae from the fruits occurred in June and July, with peak emergence of the adults in late June, July, and early August. Yet there is no change in the trends in larval population until

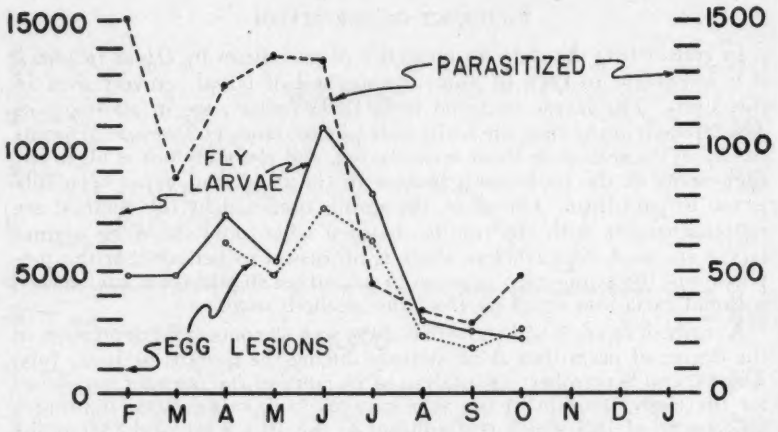

Fig. 4. Relative number of fly larvae available, larvae parasitized by *Opius fletcheri*, and number of lesions for the three areas combined. Calculated from data on fruit abundance, larval infestation, per cent of larvae parasitized, and egg lesions per fruit.

November or December. This suggests very strongly that the great majority of flies emerging during the summer months do not contribute materially to fruit infestation that season, but carry over until the following winter or even summer. Returning to the decline in parasite activity during the summer months, it is possible that this is another manifestation of the same phenomenon, arising from a depletion of the ovipositing stock which was largely developed during the preceding season. The upward inflection of the curve in October probably represents the beginning of ovipositional activity by the parasite population developed from the summer crop of fly larvae. Clearly there are many things we need to know about the mechanisms involved in the populations of both flies and parasites. At the risk of being overly axiomatic, it should be emphasized that wild populations of flies and parasites probably do not behave the same as individuals or populations reared in the laboratory where there is no marked seasonal variation in tendency to mate and lay eggs.

DISCUSSION

The analyses presented here, especially those dealing with total larval populations are subject to errors from a number of sources. One source is in the factor of number of fruits counted. The estimates of populations of larvae and parasitized larvae were necessarily based on the assumption that the immature fruits counted would have developed to maturity and sustained the same infestation as the fruits collected. Furthermore, there is the implied assumption that a decrease in fruit number with no change in population of ovipositing flies or parasites will be accompanied by a compensating increase in the degree of attack on the remaining fruit, etc.

Of these two assumptions, the latter is probably the more tenuous, and at present there is no way of assessing its validity.

However, if we accept the estimates at face value, then there is a drop in the activities of *Opius fletcheri* during the summer months. It would appear that while the number of larvae available for oviposition fell, the number of ovipositing female parasites declined even more rapidly. It is unfortunate that *Opius watersi* has not become established in Hawaii, for this is a species which undergoes a winter diapause. Possibly its different seasonal cycle would result in a more prolonged period of parasite activity during the summer months, augmenting the work of *Opius fletcheri* at its weakest point.

The data presented here are not comparable with any of the published data obtained during the early years of the invasion of Hawaii by *Dacus cucurbitae*. Back and Pemberton (1917, pp. 17-18) cited one instance of a single collection of *Momordica* from the Kona district of the island of Hawaii in November, 1914, which averaged 6.5 larvae per fruit. Willard (1920, p. 437) published additional data on collections from this same district made by Pemberton in May of 1916 and April of 1918. These averaged 4.0 and 0.3 larvae per fruit respectively (a ratio of 13:1). This very significant decline was presumed due to the activities of *Opius fletcheri* which was first liberated there during the summer of 1916. While there is no doubt that the parasite was in part responsible for lowered abundance of the fly, it is important to note that marked seasonal variations in infestation do occur. Moreover, it cannot be safely assumed that the cycle is the same from year to year. In the present study the minimum infestation found in any one month was 2.3 larvae per fruit, while the maximum was 5.8 (a ratio of only 2.5:1). These were in different localities on Oahu so the data are therefore not directly comparable, and neither figure can be compared with the single collection records from Hawaii in 1914, 1916 and 1918. The only way to obtain a reliable measure of infestation is to make collections of fruit at regular intervals over a period of at least a year. These need not be at monthly intervals, but should not be at intervals greater than two months. When the data presented here were analyzed on the basis of bimonthly collections, the average deviation from the mean infestation of 3.5 was only 8.0 per cent. But when analyzed on the basis of trimonthly collections, the average deviation from the mean was 29.7 per cent. Had only three collections per year been made, an average deviation of 35.1 per cent could have been expected.

SUMMARY

1. The results of one year's study of the infestation of *Momordica balsamina* by *Dacus cucurbitae* and of the seasonal incidence of *Opius fletcheri* are presented.

2. Fruiting of *Momordica* was heaviest from April through July, with the maximum occurring in June. This followed the curve for commercial production of host plants.

3. The mean infestation, based on twelve monthly readings, was 3.1, 3.4, and 4.1 larvae per fruit in the Waianae, Kahuku, and Waimanalo areas respectively.

4. The incidence of parasitism by *Opius fletcheri* was significantly lower during the months of June, July, August and September than during the rest of the year.

5. It is suggested that this decline in incidence of parasitism may have been due to depletion of the population of ovipositing female parasites at a rate more rapid than that of the fly stock. It was not due to swamping of the parasite population by a large increase in the number of fly larvae available for attack.

6. The interval between maximum larval populations of both fly and parasite in June, and the beginning of the upward trend in October was considerably greater than the minimum pupal and preoviposition period for either species. It is thought that this may reflect a natural lag in the ovipositional activities of field populations of flies and parasites.

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Table 1. Data on fruits collected in Makaha Valley, near Waianae, Oahu. 1950-1951.

Date	Fruit Seen	Fruit Coll.	% Fruit Stung	Stings per Fruit	Larvae per Fruit	Av. wt. Fruit	Flies + Paras.	% Paras.
Feb. 3.....	125	63	100	2.6	2.5	3.1	94	40.4
Mar. 6.....	150	75	100	3.6	5.5	3.7	383	26.8
Apr. 5.....	254	116	100	3.6	4.2	3.2	421	24.2
May 3.....	442	155	96	3.0	3.1	4.1	429	25.8
June 5	780	287	96	2.4	2.3	5.1	524	17.9
July 3.....	381	147	88	2.3	3.0	4.0	403	6.4
Aug. 7	210	91	76	1.7	2.8	4.3	249	15.6
Sept. 11	250	120	92	2.3	2.9	3.5	314	18.2
Oct. 9.....	540	237	91	2.4	1.8	4.1	399	10.5
Nov. 6	349	186	81	1.5	1.3	4.0	211	41.7
Dec. 4.....	284	145	99	2.5	4.7	3.9	616	24.0
Jan. 15.....	131	64	97	3.4	3.2	3.7	151	21.2
Total	3,771	1,686	..	..	..	..	4,194	..
Mean	...	...	93	2.6	3.1	3.9	...	22.7

Table 2. Data on fruits collected near Kahuku, Oahu. 1950-1951.

Date	Fruit Seen	Fruit Coll.	% Fruit Stung	Stings per Fruit	Larvae per Fruit	Av. wt. Fruit	Flies + Paras.	% Paras.
Feb. 8.....	544	173	..	..	4.9	3.4	610	25.4
Mar. 8	260	112	..	..	4.7	4.2	493	25.9
Apr. 10.....	438	191	99	3.6	4.8	4.5	880	28.2
May 10.....	388	127	91	2.2	2.6	5.3	263	30.7
June 14	1,204	308	92	2.1	4.2	5.6	1,093	13.9
July 10.....	836	312	88	2.3	3.2	4.3	879	5.0
Aug. 21.....	385	150	93	2.3	2.2	4.0	263	20.2
Sept. 18	283	97	89	2.1	3.2	3.7	270	10.4
Oct. 16.....	226	108	92	1.8	1.8	3.4	170	44.1
Nov. 27	627	136	95	2.8	1.9	4.8	192	26.6
Dec. 18.....	...	50	100	2.7	3.9	3.2	176	13.6
Jan. 22.....	...	39	87	1.8	2.8	2.9	94	21.3
Total	5,191	1,803	..	..	..	..	5,383	...
Mean	...	...	93	2.4	3.4	4.1	...	22.1

Table 3. Data on fruits collected near Waimanalo, Oahu. 1950-1951.

Date	Fruit Seen	Fruit Coll.	% Fruit Stung	Stings per Fruit	Larvae per Fruit	Av. wt. Fruit	Flies + Paras.	% Paras.
Feb. 16.....	533	218	100	2.7	3.6	2.1	695	36.4
Mar. 22.....	759	313	100	4.5	3.8	3.8	1,050	12.1
Apr. 19.....	1,104	328	95	3.3	3.7	6.3	1,125	9.6
May 15.....	880	274	87	3.1	3.4	4.4	781	23.3
June 19	772	235	99	4.0	5.2	4.4	1,038	8.2
July 17.....	935	381	95	3.7	4.5	3.3	1,523	5.6
Aug. 28	388	167	99	2.9	3.9	2.8	609	4.7
Sept. 25	299	123	86	2.5	3.0	4.5	324	6.5
Oct. 30.....	295	185	99	2.9	3.0	2.3	467	22.9
Nov. 29.....	...	173	100	3.1	3.9	3.9	574	33.1
Jan. 3.....	...	76	100	3.3	5.2	2.9	354	34.7
Jan. 29.....	...	44	100	1.3	5.8	1.8	225	40.0
Total	5,149	2,517	..	..	..	..	8,765	...
Mean	...	...	97	3.1	4.1	3.5	...	19.8

Table 4. Total and mean values for all three areas combined. 1950-1951.

Date	Fruit Seen	Fruit Coll.	% Fruit Stung	Stings per Fruit	Larvae per Fruit	Av. wt. Fruit	Flies + Paras.	% Paras.
Feb.	1,202	454	100	..	3.7	2.9	1,399	34.1
Mar.	1,166	500	100	..	4.7	3.9	1,926	21.6
Apr.	1,796	635	98	3.5	4.2	4.7	2,426	20.3
May	1,710	556	91	2.9	3.0	4.6	1,473	26.6
June	2,756	830	96	2.7	3.9	5.0	2,655	13.3
July	2,152	840	90	2.9	3.6	3.9	2,805	5.7
Aug.	983	408	89	2.6	3.0	3.2	1,121	13.5
Sept.	832	340	89	2.3	3.0	3.9	908	11.7
Oct.	1,061	530	94	2.5	2.2	3.3	1,036	25.8
Nov.	...	467	92	2.6	2.4	4.2	977	33.8
Dec.	...	271	100	2.8	4.6	3.3	1,146	24.1
Jan.	...	147	95	2.6	3.9	2.8	470	27.5
Total	12,456	5,978	..	..	..	..	18,342	...
Mean	...	...	94	2.7	3.5	3.8	...	21.5

Least difference for significance: (19:1)..... 16.3
(11:1)..... 23.0

Table 5. Commercial production of principal crops serving as hosts of *Dacus cucurbitae*, in short tons per month, Island of Oahu, 1950. Slightly modified from "1950 Statistics of Diversified Agriculture in Hawaii," University of Hawaii, College of Agriculture, May 1951. The total number of *Momordica* seen at the three localities used in this study are given at the bottom for comparison.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Tomatoes	60	40	40	65	75	110	100	75	63	100	100	63
Cucumbers	35	40	40	35	63	75	25	25	40	45	25	15
Peppers, Eggplant	25	23	23	75	63	63	53	23	25	35	35	15
Squash, Pumpkin	6	6	6	6	7	7	17	9	9	8	9	9
Watermelon	0	0	0	100	200	500	350	250	125	50	25	5
Total	126	109	109	281	413	755	545	382	262	238	194	107
Momordica	....	1202	1166	1796	1710	2756	2152	983	832	1061	....	....

Four new Hawaiian Liriomyza species and notes on other Hawaiian Agromyzidae (Diptera)[1]

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While preparing a revision of the North American species which key out to *Agromyza pusilla* Meigen in either of Malloch's two keys (1913, 1918), the writer found the species herein described to be distinct. Because of the relative importance of these species from an economic standpoint, it was felt that names should be given to them immediately. However, these species will be included in the revisional paper so that they may be placed in the keys and be compared directly with the other species in the group. A key is not included here because certain of the specimens studied do not belong to any of the described species. More specimens are needed before further descriptions can be made.

According to the descriptions, none of the four new species is similar to any species described by Malloch from Formosa (1914) or from Australia (1925, 1927). Paratypes of two of Watt's species (1923), which can be placed in the genus *Liriomyza*, were studied at the Illinois Natural History Survey collection. Neither of them is similar to the Hawaiian species.

The writer wishes to acknowledge the invaluable help of Dr. D. Elmo Hardy and Wallace C. Mitchell, of the University of Hawaii, in collecting and sending specimens especially for this study.

Liriomyza pullata new species

Female—Shining black and yellow. Head yellow, ocellar triangle and back of head black, black of back reaching eye margin immediately dorsad of the median posterior curve and extending to vertex; both vt setae arising from the black area, but vti at edge of black; genovertical plates not darkened. Thorax with black of mesonotum extending nearly to humeri and slightly beyond prs, sa, and outer pa setae; posteriorly extending from outer pa seta to scutellum; scutellum with lateral black triangles of moderate size, basal sc setae arising from the edge of the triangles, but on the black; humeri with black area small, h seta arising from the yellow; anepisternum with black triangle about three-fifths its anterior height and extending posteriorly the entire ventral length, and uniting with a relatively broad black line along the posterior margin; katepisternum with an equilateral black triangle; meropleurite posteriorly about three-fourths black; rest of pleura yellow except for a relatively wide black stripe below the wing base. Legs with femora yellow, each with a small dorsal black spot at base, hind pair with a dorsal black stripe distally; tibiae and tarsi brownish. Wings hyaline, calypters with margin and fringe black. Abdomen intense shining black; only the second tergite narrowly yellow laterally, and with a narrow yellow stripe centrally; all segments posteriorly very narrowly yellow; sixth segment about one-third yellow; seventh segment shining black.

[1] Scientific Paper No. 1093, Washington Agricultural Experiment Stations, Pullman.

Head—Oval in profile. Eye only one and two-tenths times as high as long. Gena, midway between vibrissal angle and posterior margin, about one-fourth eye height; vibrissae strong, three short setae on subcranial margin. Genovertical plates not raised above eye margins; two sfo and two ifo setae; orbital setulae sparse, about four on a side. Antennae with third segment rounded, broader than long; setulae shorter than basal aristal thickness; arista about as long as eye width, slightly thickened on basal one-fourth, distally tapering uniformly, setulae minute. Mouthparts of normal size.

Thorax—Setae of moderate length. First dc seta the longest, but only slightly longer than the second, third about two-thirds as long as first, and fourth about one-third as long as the first; second dc seta about one and three-fourths as far from the first as the third is from the second; fourth as far from third as third is from second; ia present, subequal to acr setae; inner pa seta one-half as long as outer pa; acr in four irregular rows, extending posteriorly to second dc setae, only about three posterior to this; seven and eight setae in the ia rows posterior to the transverse suture. Humeri with two or three setulae each, plus the h. Anepisternum with two dorsally directed setulae and three posteriorly, the latter in line with the aes.

Wing—About twice as long as broad. Costa terminating slightly posterior to wing tip, second costal segment about 2.5 times as long as the third, fourth about two-thirds as long as third; cross vein m-m at about its own length from r-m, at a strongly acute angle to penultimate section of M_{1+2}; ultimate section of M_{1+2} about 11 times as long as the penultimate; ultimate section of M_{3+4} about 2.6 times as long as the penultimate.

Abdomen—Setae of moderate length, about three-fourths the length of the tergites, those on sixth segment longer; seventh segment with two irregular rows of short setae.

Size—1.5 mm. in body length.

Male—Smaller, about 1.25 mm. in body length; wing with ultimate section of M_{1+2} about 10 times as long as penultimate; second abdominal tergite laterally yellow, all others narrowly yellow laterally, dorsally the second segment with center yellow stripe, all segments very narrowly yellow along posterior margins, sixth segment about one-fourth yellow; ninth tergite black, cerci bright yellow.

Holotype ♀ : Kanoa, Molokai, March 3, 1929, O. H. Swezey, collector, ex *Datura* sp., deposited in the Hawaiian Sugar Planters' Association Experiment Station collection. *Paratypes:* 1 ♀, topotypical; 1 ♀, Makolelau, Molokai, March 23, 1929, O. H. Swezey, collector, ex *Lipochaeta* sp.; 1 ♀, Honolulu, Oahu, September, 1951, W. C. Mitchell, collector, ex *Aster* sp.; 1 ♂, 1 ♀, Waimanalo, Oahu, January 31, 1951, D. E. Hardy, collector, sweeping; 1 ♀, Honolulu, Oahu, April, 1951, D. E. Hardy, collector, at light. Paratypes have been deposited in the collections of the U. S. National Museum, University of Hawaii, and that of the writer. Also studied was a headless male reared from *Aster* sp., same data as the female reared from *Aster*.

L. pullata is most closely related to *L. canomarginis* and has in common with it the prs seta arising from the black of the mesonotum, basal sc setae arising from the black lateral triangles, cross vein m-m at an acute angle to the penultimate section of M_{1+2}, and the setae of the abdomen equal in length to about three-fourths a tergal length. *L. pullata* is distinguished by the relatively short third and fourth dc setae, particularly the latter, the second dc seta being nearly twice as far from the first as from the third, margin of the calypter black, and the black abdomen with lateral and central yellow areas on the second tergite.

Liriomyza canomarginis new species

Male—Shining yellow and black. Head yellow, ocellar triangle and back of head black, black of back reaching eye margin immediately dorsad of the median posterior curve and extending dorsally to vertex; both vt setae arising from black area, although vti at edge; genovertical plates not darkened. Thorax with black of mesonotum extending laterally nearly to humeri, with the prs, sa and outer pa setae at the edge of the black; inner pa arising from black; scutellum with basal setae arising from the edge of the black lateral triangles; humeral black spot small, two setulae in it, other setulae and h on yellow; anepisternum with black area about one-half the anterior height and extending for nearly the entire ventral length, the dorsal margin slopes towards the posteroventral angle of the aes, and then rises abruptly to include the row of setae along the posterior margin; katepisternum with an equilateral black triangle; meropleurite posteriorly about two-thirds black; rest of pleura yellow except for a rather thin elongate black stripe extending from the wing base nearly to the posteroventral angle of the aes. Legs with femora yellow except for a small dorsal black area on all pairs, and a few darker stripes, particularly on hind pair; tibiae brownish, tarsi somewhat darker. Wings hyaline, margin and fringe of calypters scarcely darkened, grayish. Abdomen black dorsally, all tergites laterally rather broadly yellow, yellow extending onto dorsum; all tergites narrowly yellow posteriorly, sixth wider, about one-fourth the tergal length; ninth tergite black, cerci yellow.

Head—Oval in profile. Eye about one and one-third times as high as long. Gena, midway between vibrissal angle and posterior margin, about one-fifth eye height; vibrissae well developed, two setae on subcranial margin. Genovertical plates slightly raised above eye margins immediately dorsad of antennae; each with two sfo and two ifo setae; orbital setulae sparse, three or four on a side. Antennae with third segment rounded, broader than long; setulae about equal in length to the basal aristal thickness; arista short, in length slightly less than the eye width, tapering uniformly, setulae minute. Mouthparts of normal size.

Thorax—Setae relatively long, slender. Second dc seta about three-fourths the length of the first, the third nearly equal in length to the second, and the fourth about one-half as long as the first; second dc about one and one-half times as far from the first as from the third, third and fourth about as far apart as second and third; ia absent, four and five setae in the ia rows posterior to the transverse suture; acr setae in four irregular rows extending posteriorly to the second dc setae, only two or three posterior to this; inner pa weak, about two-fifths the length of the outer pa. Humeri with three setulae plus the h. Anepisternum with two dorsally and two posteriorly directed setulae, the latter situated one on each side of the aes.

Wing—Slightly more than twice as long as wide; costa terminating at wing tip; second costal section about 2.8 times as long as the third; third section slightly longer than the fourth; cross vein m-m about three-fourths of its length from r-m, at an acute angle to penultimate section of M_{1+2}; ultimate section of M_{1+2} about 13 times as long as the penultimate; ultimate section of M_{4+5} about 3.5 times as long as the penultimate.

Abdomen—Setae moderately elongate, about three-fourths a tergal length, those on sixth segment slightly longer.

Size—1.25 mm. in body length.

Female—Larger, 1.5 mm. in body length; genovertical plates not raised above eye margins; humeri with two setulae; anepisternum with three dorsally directed setulae; abdomen with tergites narrowly yellow laterally, posteriorly with narrow yellow margins, sixth tergite about one-sixth yellow; seventh segment shining black.

Holotype ♂: Kaimuki, Oahu, April 12, 1921, O. H. Swezey, collector, ex *Indigofera* sp., deposited in the Hawaiian Sugar Planters' Association Experiment Station collection. *Paratypes:* 2 ♂ ♂, 5 ♀ ♀, Lualualei, Oahu, June 26, 1943, T. Nishida, collector, ex bean; 1 ♂, Honolulu, Oahu, April, 1951, D. E. Hardy, collector, at light. Paratypes have been deposited in the collections of the U. S. National Museum, University of Hawaii, and that of the writer.

The genovertical plates are usually slightly raised above the eye margins immediately dorsad of the antennae. This may not be evident when the head is partially collapsed due to the drying of teneral specimens. The angle of cross vein m-m to the penultimate section of M_{1+2} is not constant. In about one-half of the specimens examined, this vein was strongly acute and in the remainder it was slightly acute, but never perpendicular.

As stated under *L. pullata,* that species and *L. canomarginis* have a number of characters in common which separate these two species from *L. minutiseta* and *L. hawaiiensis. L. canomarginis* can be separated from *L. pullata* by the grayish margin of the calypter, the relatively long third and fourth dc setae, the second dc being only one and one-half times as far from the first as from the third, and the abdominal tergites being at least narrowly yellow laterally.

Liriomyza minutiseta new species

Female—Shining yellow and black. Head yellow, ocellar triangle and back of head black, black of back reaching eye margin at posterior median curve and extending dorsally to vertex; vte seta arising from the black color, vti arising from yellow, at the edge of a slightly darkened area, which is orange in color; genovertical plates not darkened. Thorax with black of mesonotum extending laterally nearly to humeri and prs setae, the sa and outer pa setae arising from black, prs seta at edge of black, usually touching it; black extending straight from outer pa to inner one-third of scutellar width before reaching it; scutellum with lateral black triangles very small, basal pair of setae arising from yellow color, close to edge of the triangles; humeral black spot very small, only one setula on black, others and h on yellow; anepisternum with a small black spot about one-fourth its anterior height, with a slightly darkened stripe extending dorsally along anterior margin for about one-half its height, making the black area subtriangular in shape, and about one-half its ventral width; katepisternum with an equilateral black triangle; meropleurite more than one-half black posteriorly; rest of pleura yellow except for an elongate posteriorly curving, brown area beneath wing base. Legs with femora bright yellow; tibiae tan; tarsi brown. Wings hyaline, calypters with margin and fringe blackish. Abdomen black dorsally, all tergites laterally yellow for a width equal to the portion of the tergites visible in lateral view; sixth segment posteriorly about one-third yellow; seventh segment shining black.

Head—Moderately elongate in profile. Eye about one and one-third times as high as long. Gena, midway between vibrissal angle and posterior margin, about one-fourth eye height; rather narrow; vibrissae well developed, three and four setae on the subcranial margins. Genovertical plates not raised above eye margins; each bearing 2 sfo and 2 ifo setae, and two or three orbital setulae, latter minute. Antennae with third segment rounded, broader than long; setulae slightly less in length than the basal aristal thickness; arista thickened on basal one-fourth, tapering uniformly distally, long, slightly greater than the eye width. Mouthparts of normal size.

Thorax—Setae relatively short. Second dc seta about three-fourths the length of the first, the third about one-half the first, and the fourth only two-fifths the first; second dc about one and one-half times as far from the first as from the third, third and fourth about as far apart as the second to the third; ia present, subequal to an acr in length; inner pa slender, minute, about one-third the length of the outer pa; acr in four irregular rows, extending posteriorly to about midway between first and second dc, very sparse posterior to second dc, only two or three present; seven setulae in the ia row posterior to the transverse suture. Humeri each with two or three setulae plus the h. Anepisternum with one dorsally directed setula and posteriorly three in a row with the aes.

Wing—Slightly more than twice as long as wide; costa terminating at wing tip; second costal segment about 3.5 times as long as the third and fourth segments, which are of equal length; cross vein m-m at about its own length from r-m, at a very slight acute angle to penultimate section of M_{1+2}; ultimate section of M_{1+2} about 10 times as long as the penultimate; ultimate section of M_{3+4} about 3 times as long as the penultimate.

Abdomen—Setae relatively short, in length about one-half the tergal length; those on the sixth segment slightly longer; seventh segment encircled with two irregular rows of setae.

Size—1.3 mm. in body length.

Male—Smaller, 1.25 mm. in body length; anterior stripe of anepisternal black spot absent; two setulae on dorsal margin of anepisternum; abdomen more yellowish, yellow wider laterally, extending onto dorsum, fourth and fifth tergites posteriorly about one-fourth yellow; ninth tergite dark brown, cerci brownish.

Holotype ♀: Honolulu, Oahu, September 7, 1951, W. C. Mitchell, collector, ex tomato, deposited in the Hawaiian Sugar Planters' Association Experiment Station collection. *Paratypes:* 2 ♂ ♂, 1 ♀, topotypical; 3 ♂ ♂, Waianae, Oahu, January, 1951, W. C. Mitchell, collector, ex tomato; 3 ♂ ♂, 1 ♀, Waianae, Oahu, March, 1951, W. C. Mitchell, collector, ex tomato; 1 ♂, 2 ♀ ♀, Honolulu, Oahu, September 7, 1951, W. C. Mitchell, collector, ex eggplant; 1 ♂, 3 ♀ ♀, Honolulu, Oahu, September 7, 1951, W. C. Mitchell, collector, ex cauliflower; 2 ♂ ♂, Kunia, Oahu, September, 1951, D. E. Hardy, collector, ex squash. Paratypes have been deposited in the collections of the U. S. National Museum, University of Hawaii, and that of the writer.

The anepisternal black spot is frequently small and oval in shape, as in the male, but may have an anterior dorsal extension, making the spot subtriangular in shape, as in the holotype. In two out of the seventeen specimens examined, cross vein m-m is one and one-half times its length from r-m. Also, m-m may be perpendicular to the penultimate section of M_{1+2} and is never at a strongly acute angle.

L. minutiseta and *L. hawaiiensis* are more closely related than the other two species and have in common the prs seta arising from the yellow of the mesonotum, basal sc setae arising from the yellow of the scutellum, and cross vein m-m at a slightly acute angle or perpendicular to the penultimate section of M_{1+2}. *L. minutiseta* may be separated from *L. hawaiiensis* by the vti seta arising from the yellow of the vertex, the short thin setae, minute inner pa, small black area on the anepisternum, second dc seta one and one-half times as far from the first as the first is from the third, and the length of the abdominal setae being about one-half a tergal length.

Liriomyza hawaiiensis new species

Female—Shining yellow and black. Head yellow, ocellar triangle and back of head black, black of back reaching eye margin immediately dorsad of median posterior curve and extending dorsally to vertex; both vt setae arising from black area, although vti is at edge; genovertical plates not darkened. Thorax with black of mesonotum extending laterally nearly to humeri, prs, and outer pa setae, sa seta in black, black extending in a curve from outer pa seta to scutellum so that inner pa is at edge of black and the posterolateral angles of the mesonotum are broadly yellow; scutellum with lateral black triangles small, basal pair of setae arising from yellow color, at edge of the black; humeral black spot very small, h seta arising from yellow, as are all setulae but one or two; anepisternum with black triangle about two-thirds its anterior height and three-fourths its ventral width, a faint thin black line along posterior margin running through base of aes seta; katepisternum with an equilateral black triangle; meropleurite posteriorly about one-half black; rest of pleura yellow except for a thin black stripe below base of

wing, with a black spot posteriorly. Legs with femora bright yellow; tibiae and tarsi dark brown. Wings hyaline, calyters with margin and fringe blackish. Abdomen black dorsally, tergites narrowly yellow posteriorly, first four narrowly, fifth slightly broader, and sixth about one-half yellow; all tergites broadly yellow laterally for a width equal to the portion of the tergites visible in lateral view; seventh segment shining black.

Head—Elongate and flattened in profile. Eye about one and one-half times as high as long, somewhat narrowing ventrally. Gena, midway between vibrissal angle and posterior margin, about one-fourth the eye height; narrow, receding anteriorly and only about as long as high; vibrissae well developed, four setae on ventral margin. Genoverticals plates not raised above eye margins; two sfo and 2 ifo setae; orbital setulae minute, about six on each side. Antennae with third segment rounded, broader than long; setulae slightly longer than basal aristal thickness; arista uniformly tapering, about as long as eye width, aristal setulae minute. Mouthparts of normal size.

Thorax—Setae strikingly long and strong. Second dc seta about three-fourths as long as first, third about one-half the first, and fourth about two-fifths the first; posterior three dc setae about equally spaced from each other, fourth a little closer; ia present, about one and one-half times as long as an acr seta; inner pa strong, slightly more than half as long as outer pa; acr in four irregular rows extending posteriorly nearly to first dc seta, becoming sparser posterior to second dc; eight to eleven setae in the ia rows posterior to the transverse suture. Humeri each with six setulae plus the h seta. Anepisternum with three dorsally directed setulae near dorsal margin and two posteriorly directed setulae, one on each side of the aes seta, along posterior margin.

Wing—About twice as long as wide; costa terminating at wing tip; second costal section about 4 times as long as third and fourth sections, which are of equal length; cross vein m-m about its own length from r-m, perpendicular to penultimate section of M_{1+2}; ultimate section of M_{1+2} about 11 times as long as the penultimate; ultimate section of M_{3+4} about 3 times as long as the penultimate.

Abdomen—Setae relatively long, subequal in length to the tergal length, those on sixth segment one and one-half times as long; two irregular rows of setae encircling seventh segment.

Size—1.5 mm. in body length.

Male—Similar, smaller, 1.25 mm. in body length; cross vein m-m vestigial in left wing; abdomen much more yellowish, yellow posterior margins of tergites about one-fourth the tergal length, sixth segment predominately yellow; ninth tergite brownish, cerci bright yellow.

Holotype ♀: Honolulu, Oahu, January 1, 1947, E. C. Zimmerman, collector, ex leaf of *Cleome* sp., deposited in the collection of the Hawaiian Sugar Planters' Association. *Paratypes:* 1 ♂, 1 ♀, topotypical; 2 ♂ ♂, Lanai, October 6, 1939, H. Akamine, collector, ex daikon; 1 ♂, 3 ♀ ♀, Waiakoa, Maui, September 18, 1951, H. A. Bess, collector, ex cabbage; 2 ♀ ♀, Kahului, Maui, September 18, 1951, B. Kumabe, collector, ex cabbage; 15 ♂ ♂, 15 ♀ ♀, Hilo, Hawaii, April, 1951, H. A. Bess, collector, ex cabbage; 1 ♀, Hilo, Hawaii, December 12, 1927, Goff, collector, ex Chinese cabbage; 2 ♂ ♂, 2 ♀ ♀, Honolulu, Oahu, March 8, 1945, O. H. Swezey, collector, ex nasturtium; 3 ♂ ♂, 4 ♀ ♀, Waianae, Oahu, January, 1951, W. C. Mitchell, collector, ex tomato; 2 ♀ ♀, Honolulu, Oahu, September 7, 1951, W. C. Mitchell, collector, ex tomato. Paratypes have been deposited in the collections of the U. S. National Museum, University of Hawaii, and that of the writer. Seventeen specimens, in inferior condition, are also placed in this species.

L. hawaiiensis is apparently common and widespread. It is most closely related to *L. minutiseta,* from which it can be distinguished by the vti arising from the edge of the black of the vertex, the very long strong

setae, the very narrow gena which is as high as long, the long narrow eye which is one and one-half times as high as long, the antennal setulae longer than the basal aristal thickness, the subequal spacing of the dc setae, and the length of the abdominal setae which are subequal to a tergal length.

NOTES ON OTHER HAWAIIAN SPECIES

Melanagromyza Hendel

Melanagromyza simplex (Loew)

Agromyza simplex Loew, 1869, Berl. ent. Zeit., 13:46.

Bianchi (1941) first reported the asparagus miner in the Hawaiian Islands when he described a heavy infestation on the island of Oahu. Found wherever asparagus is grown, this is no doubt an introduced species. Four specimens were examined from Waimea, Oahu, collected by O. H. Swezey on May 18, 1937, in an asparagus field.

Ophiomyia Braschnikov

Ophiomyia lantanae (Froggatt)

Agromyza lantanae Froggatt, 1919, Agric. Gaz. New South Wales, 30:665.

Froggatt's description was of a popular nature so Aldrich (1923) redescribed the species. Hardy (in correspondence) states that there are paratypes in the H.S.P.A. Experiment Station collection. These were no doubt designated by Aldrich at the time of the redescription. It is doubtful if a holotype, as such, exists.

O. lantanae was introduced into Hawaii in 1902, through the efforts of Albert Koebele, working in Mexico, and R. C. L. Perkins, to aid in the control of *Lantana camara* (Perkins & Swezey, 1924). The male of this species is easily distinguished by the extremely long, slender, upcurved vibrissal fascicule of setae. The following data were obtained from specimens examined: 3, Pacific Heights, Oahu, November 21, 1903; 2, Honokaa, Hawaii, March 18, 1922, O. H. Swezey, collector; 4, Kunia, Oahu, February 14, 1950, R. van den Bosch, collector, on *Lantana camara*.

Ophiomyia sp.

Agromyza sp.: Van Zwaluwenburg, 1942, Proc. Haw. Ent. Soc., 11:148.

The writer has studied two specimens reared from leaf mines on *Scaevola frutescens* from Canton Island. The species appears to be distinct. It is not here described because of the short series and the lack of specimens from Guam and Samoa.

Phytobia Lioy

Subgenus *Calycomyza* Hendel

Phytobia (Calycomyza) humeralis (von Roser)

Agromyza humeralis von Roser, 1840, Korresp.-Bl. Würtem. landw. Ver., 8:63.

This Holarctic species is apparently quite abundant, at least on the island of Oahu. The larvae mine in the leaves of many species of Compositae (Hendel, 1931; Frick, 1952). The Hawaiian specimens bore the following data: 11, Honolulu, Oahu, September 29, 1950, W. C. Mitchell, collector, ex *Aster* sp.; 1, Honolulu, Oahu, February 21, 1951, R. van den Bosch, collector, by sweeping.

Phytobia (Calycomyza) jucunda (van der Wulp)

Agromyza jucunda van der Wulp, 1867, Tijdschr. Ent., 10:161.

The larvae of *P. jucunda* mine the leaves of a number of species of Compositae (Frick, 1952). Neither of the specimens from Hawaii was reared. One was collected by sweeping, Honolulu, Oahu, February, 1951, R. van den Bosch, collector, and the other at a light trap, Hickam Field, Oahu, July, 1945.

Liriomyza Mik

Liriomyza brassicae (Riley)

Oscinis brassicae Riley, 1884, Ann. Rept. U.S.D.A., 1884:322.

Eight specimens, which agree with reared material from California, were collected by sweeping. This species may be distinguished from the four new species by the narrow black stripes extending from the vertex down the genovertical plates along the eye margins. The larvae mine the leaves of various crucifers. However, judging from the collecting records, the dominant species on cruciferous crops in Hawaii would appear to be *L. hawaiiensis* n. sp. Seven of the specimens studied are from Waimanalo, Oahu, January 31, 1951, D. E. Hardy, collector, sweeping, and one is from Honolulu, Oahu, January, 1951, D. E. Hardy, collector, sweeping.

Phytoliriomyza Hendel

Phytoliriomyza perpusilla (Meigen)

Agromyza perpusilla Meigen, 1830, System. Beschr. bekann. eur. zweifl. Insekt., 6:181.

This widespread Holarctic species is represented by one specimen collected by W. W. Wirth, July 25, 1946, on Mt. Kaala, Oahu, at an elevation of 4,000 feet.

Pseudonapomyza Hendel

Pseudonapomyza spicata (Malloch)

Phytomyza spicata Malloch, 1914, Ann. Mus. Hungar., 12:334; Bezzi, 1928, Dipt. Fiji, pg. 167 (as *P. atra*); Malloch, 1935, Insect. Samoa, 6 (9) :341; Swezey, 1941, Haw. Plant. Rec., 45:26; Swezey, 1946, Bishop Mus. Bull., 189:200; Swezey, 1948, Jour. Econ. Ent. 41:671.

Pseudonapomyza spicata (Malloch) : Hendel, 1920, Arch. Nat., Abt. A., 84:115; Hendel, 1932, in Lindner: Die Flieg. palaearkt. Reg., 59:302; Frick, 1952, Univ. Calif. Publ. Ent., 8:418.

This species belongs in the genus *Pseudonapomyza*, as Hendel believed, but is distinct from *P. atra* (Meigen), 1830 (Frick, 1952). Swezey (1941)

had not found *P. spicata* in Hawaii, but by 1946 it had become established on 14 species of grasses (Swezey, 1948). Bezzi (1928) reported the species as a miner of corn and sugar cane. The distribution now includes Formosa, Fiji, Samoa, Guam, and the islands of Oahu, Maui and Molokai.

Seventeen specimens were studied, which had the following data on the labels: 2, Piti, Guam, July 31, 1936, O. H. Swezey, collector, leaf miner on corn; 2, Hawaiian Sugar Planters' Experiment Station, Honolulu, Oahu, November 25, 1946, R. H. Van Zwaluwenburg, collector; 5, Kailua, Oahu, November 26, 1946, O. H. Swezey, collector, ex corn; 1, Hawaiian Sugar Planters' Experiment Station, Honolulu, Oahu, February, 1947, R. H. Van Zwaluwenburg, collector, ex sugar cane seedling leaves; 1, Mt. Tantalus, Oahu, November 12, 1950, D. E. Hardy, collector; 5, Ewa, Oahu, November 23, 1951, W. C. Mitchell, collector, sweeping *Gynandropsis* sp.; 1, Honolulu, Oahu, November, 1951, D. E. Hardy, collector, on window of laboratory.

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New Species and Additional Records of Heteroptera from the Marshall Islands

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In a previous report (Proc. Haw. Ent. Soc., 14:315-321, 1951) twenty species of Heteroptera were recorded from the Marshall Islands. Now, after only a year, so much additional material has come to hand that a supplementary report is needed. Most of the additional records and specimens were received from Dr. R. I. Sailer, who painstakingly extracted them from the voluminous collections in his charge at the U. S. National Museum. The National Museum material was collected by H. K. Townes, R. G. Oakley and A. C. Cole. Other supplementary records are based upon the collections of Dr. Ira La Rivers on Arno and Majuro atolls in 1950, made in connection with the Coral Atoll Project of the National Research Council through its Pacific Science Board with funds provided by the Office of Naval Research.

In the present paper two families of Heteroptera, the Coreidae and Cimicidae, are recorded from the Marshall Islands for the first time; three species are described as new (one of these was recorded in error as *Campylomma tahitica* Knight in the previous list); the family Aradidae is added on the basis of a published record which should be checked, preferably by comparison with China's type specimen in the British Museum (Natural History); and new records are given for eleven species which had been recorded previously from one or more of the Marshall Islands. The total count of Heteroptera is raised from 20 to 24 species. Types of the new species have been deposited in the U. S. National Museum.

The discovery of three apparently endemic species of Heteroptera in the Marshalls is of unusual interest. Coral atolls are generally characterized by lack of endemics. Nevertheless, close study in various parts of Micronesia indicates that certain groups of terrestrial animals show a tendency toward speciation. The Micronesian pigeon is a case in point among the birds and the mosquito, *Aedes marshallensis* Stone and Bohart, is a local endemic of the "*scutellaris*" group, a group which is widely distributed on islands of the central Pacific. In the Heteroptera *Campylomma* and *Leptocoris*, in particular, show evidences of plasticity, with distinctive forms on every archipelago which has been collected intensively.

The occurrence of the oriental bed bug in the Marshalls is also noteworthy. Known also from the New Hebrides, Samoa and Guam, this species might be expected throughout the Marshalls. Surprisingly, this was not the case. An infestation was found in the dormitory of the Marshallese boys' school on Majuro but a diligent search in native dwellings on Arno failed to turn up any bed bugs at all.

Supplemental List of Heteroptera of the Marshall Islands

(Numbering as in previous list)

Family **Pentatomidae**

2. **Oechalia consocialis** (Boisduval)

Kwajalein, Aug. 15, '46 (Townes); Aug. 17, '46 (Oakley); Majuro, airfield, Aug. 27, '46 (Townes); Bikini, Aug. 12, '46 (J. P. E. Morrison) and July-Aug. '47 (Cole).

Family **Coreidae**

2a. **Leptocoris lariversi** new species

A relatively small species with red areas more or less infuscate, the fourth antennal segment more than one-third longer than second, the rostrum reaching only to base of second visible abdominal segment, and the pronotal disk finely, evenly punctate over most of its surface, including the inflated area in front of callosities.

Male. Head broader, including eyes, than long, 53::40, the surface impunctate, depressed along inner margins of eyes and obliquely behind bases of antennae, elsewhere inflated, the post-ocular lobes actually bulbous. Ocelli twice as far apart as distance from an ocellus to eye. Rostrum reaching to base of second visible abdominal segment, the proportion of segments one to four as 35:35:30:30. Antennae about two and one-half times as long as head and pronotum together, the proportion of segments one to four as 17:60:60:83.

Pronotum longer than head, 50::40, broader than long, 70::50, the lateral and posterior margins narrowly depressed, callosities depressed and impunctate, disk convex, very finely evenly punctate, the punctures not arranged so as to form rugosities. A narrow median carina extending from callosities backward to middle of disk. Anterior lobe finely punctured, moderately inflated and laterally lobed. Entire surface clothed with fine pubescence.

Clavus and corium finely punctured and pubescent. Membrane black, opaque.

Thoracic pleura densely clothed with an appressed, gray pubescence. Abdominal venter with fine appressed pubescence which is reddish laterally and posteriorly and gray medially and with numerous long, erect hairs arising from glabrous spots amidst the gray pubescence.

Male genitalia similar to *carnivorus* Usinger (Bishop Museum Bull. 189:26, Fig. 1b) except that the posterior arms are divergent apically. (see fig. 1c)

Color reddish with black appendages, broad black pleural areas adjacent to acetabula, black at middle of venter, black membrane and generally lightly infuscated dorsal surface.

Size: length 13 mm., width (pronotum) 3½ mm.

Holotype, male, Imrodj Island, Jaluit atoll, Aug. 24, 1946, H. K. Townes collector. One male paratype same data. Numerous paratypes, Ine island, Arno atoll, July 30, 1950, I. La Rivers collector. Also nymphs only of what is doubtless this species, Lönar island, Arno atoll, July 9, 1950, and Arno island, July 19, 1950, Earl Stone collector.

There is considerable variation in these specimens, the color being much brighter red in some with the appendages fulvous or even paler and the under surface not or scarcely infuscated. The rostrum varies a little in length, reaching middle of second visible abdominal segment in some specimens. The last antennal segment is longer as compared with the third segment, 87::60, in the Arno specimens.

Lariversi is closely related to *carnivorus* from Guam but in *carnivorus* the fourth antennal is less than one-third longer than third, 77::60, the rostrum reaches from middle of second to middle of third visible abdominal segment, the genital arms are slightly convergent, and the pronotal disk is finely but rugosely punctate. It is this last character and the more strongly inflated, superficially punctured anterior pronotal lobes that separate the two species most readily.

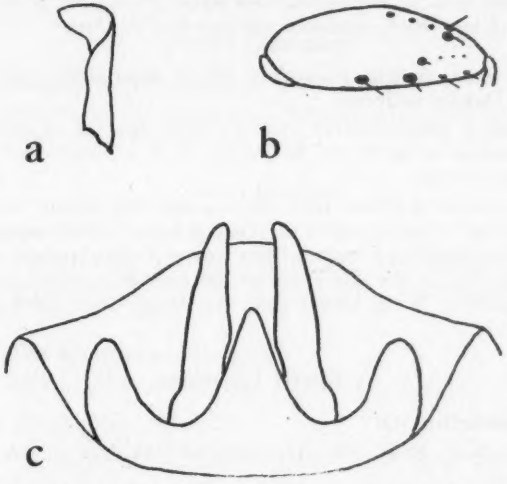

Figure 1. Outline drawings of: **a,** left genital clasper of *Riptortus saileri* Usinger, n. sp., dorsal view; **b,** hind femur of *Campylomma marshallensis* Usinger, n. sp., ventral view; **c,** genital segment of *Leptocoris lariversi* Usinger, n. sp., ventral view with pubescence omitted.

2b. **Riptortus saileri** new species

A relatively small species with upper surface and appendages brown, the sides of lateral fasciae nearly straight and continuous. Fourth antennal segment relatively short, only one-fifth longer than first segment and distinctly shorter than second and third together.

Male. Head slightly longer than wide including eyes, 46::43, the upper surface rugose and clothed with short, appressed hairs, not punctate. Ocelli closer to each other than to eyes, the distance between lenses distinctly less than distance from a lens to inner margin of eye, 13::19. Rostrum reaching hind coxae, the proportion of segments one to four as 30:34:17:33. Antennae about two-thirds as long as body, the proportion of segments one to four as 50:35:38:60. (The last segment broadly curved, measured in a straight line between base and apex.)

Pronotum about as long as wide, excluding humeral spines, 41::40, the spines slender, acute, directed postero-laterally, one-tenth as long as width of pronotum. Disk coarsely punctured behind callosities, becoming finer posteriorly, and clothed with a fine, appressed pubescence.

Apical margin of seventh abdominal tergite rather evenly arcuate. Genital claspers stout, pubescent, bent inward towards each other and broadly rounded at apices. (Fig. 1a.)

Color brown with black at apices of second and third antennal segments, humeral spines and broad stripe along middorsal surface of abdomen except at extreme base. Yellow fasciae along side of head and thoracic pleura, the head fascia slightly narrowed behind eyes, the propleural fascia a little narrower than posterior fasciae, its upper margin straight but a little higher than the posterior fasciae. Mesopleural and metapleural fasciae slightly interrupted but with their upper margins essentially in a straight line. Abdomen broadly yellow at sides including connexivum and part of the dorsal terga above and including lateral areas, sublateral areas and middle of venter, the median yellow stripe narrowing posteriorly to base of fifth segment and reappearing on sixth segment. Spiracles and trichobothria brown.

Size: length 13 mm., width (pronotum and abdomen) 2½ mm.

Holotype, male, airfield, Kwajalein island, Kwajalein atoll, August 17, 1946, R. G. Oakley collector.

This species is quite distinct from all other species, described and undescribed, known to me from the Pacific area, the antennal proportions being entirely unique.

Riptortus insularis China from Samoa and Fiji differs further in that the male genital claspers taper to acute points at their apices. *Saileri* is closest to an undescribed species from Koror, Palau Islands, the genitalia being similar, but in the latter species the fourth antennal is of the usual type in *Riptortus,* being longer than the second and third segments together.

Family Lygaeidae

3. **Nysius pulchellus** Stål

Kwajalein, Aug. 16-17, '46 (Townes and Oakley).

4. **Nysius picipes** Usinger

Bikini, July, August '47 (Cole); Likiep atoll, Aug. 30, '46 (Townes); Bigatyelang island, Ailinglapalap, Aug. 25, '46 (Townes).

5. **Ninus insignis** Stål

Majuro, Aug. 28, '46 (Townes); Medyado island, Jaluit atoll, Aug. 24, '46 (Townes).

6. **Pachybrachius pacificus** (Stål)

Medyado island, Jaluit atoll, Aug. 24, '46 (Townes); Imrodj island, Jaluit atoll, Aug. 23, '46 (Townes).

7. **Pachybrachius nigriceps** (Dallas)

Sydney Pier, Jaluit atoll, Aug. 23, '46 (Oakley).

Family Aradidae

7a. **Chiastoplonia pygmaea** China

Chiastoplonia pygmaea China, Insects of Samoa, Pt. II. fasc. 3, pp. 104-105. fig., 1930.

Imej island, Jaluit atoll, Nov. 27, '37 (T. Esaki) (See Esaki and Matsuda, Hemiptera Micronesica, III. Mushi, 22:80, 1951).

Family Nabidae

9. **Nabis capsiformis** Germar

Bikini, July-Aug. '47 (Cole); Medyado island, Jaluit atoll, Aug. 24, '46 (Townes); Imrodj island, Jaluit atoll, Aug. 23-24, '46 (Townes); Kwajalein airfield, July 17, '46 (Townes); Begatyelang island, Ailinglapalap atoll, Aug. 25, '46 (Townes).

Family Cimicidae

9a. **Cimex hemipterus** (Fabricius)

Acanthia hemiptera Fabricius, Syst. Rhyng., 113, 1803.

Uliga, Majuro, Aug. 21, '50 (La Rivers).

Family Miridae

12. **Trigonotylus brevipes** Jakowlev

Kwajalein island, Aug. 17, '46 (Oakley); Likiep island, Aug. 30, '46 (Townes); Majuro atoll, Aug. 28, '46 (Townes); Medyado island, Jaluit atoll, Aug. 24, '46 (Townes).

14. **Orthotylellus brunnescens** Usinger

Medyado island, Jaluit atoll, Aug. 24, '46 (Townes).

15. **Halticus tibialis** Reuter

Medyado island and Sydney Pier, Jaluit atoll, Aug. 23 and 24, '46 (Townes).

16. **Campylomma marshallensis** new species

A relatively small, oval species of uniformly pale color except for the brown eyes, fuscous annuli at apex of first and base of second antennal segments, and distinctive arrangement of spots on the legs. The rostrum reaches the middle of the hind trochanters.

Male. Body surface shining, clothed with subappressed, concolorous hairs above. Head nearly twice as broad as long, 40::24, interocular space half again as wide as an eye, 18::11. Rostrum reaching middle of posterior trochanters, the proportion of segments one to four as 15:15:13:15. Antennae less than half again as long as greatest width of pronotum, 73::52; proportion of segments 10:30:19:14; first two segments stout, last two slender; second segment three-fourths as long as width of head, 30::40.

Pronotum slightly more than twice as wide as long, 52::23, about as long as head and scutellum (including exposed portion of mesoscutum). Commissure of clavus scarcely longer than scutellum. Corial margin distinctly longer than width of pronotum, 65::52, cuneus about one-fourth as long as corial margin, the membrane extending half again as far beyond apex of cuneus as length of cuneus.

Color pale fulvous with brown eyes, a fuscous annulus at apex of first and base of second antennal segments, black spines on tibiae and a distinctive pattern of dots on the femora (figure 1b).

Size: length 2½ mm., width (hemelytra) 1 mm.

Female. Similar to the male but slightly shorter and wider with less incrassate second antennal segment.

Size: length 2.44 mm., width 1.1 mm.

Holotype, male, allotype, female, and fourteen paratypes, Likiep islet, Likiep atoll, Aug. 30, 1946, H. K. Townes collector.

Campylomma marshallensis runs to *adamsoni* in Knight's key (B. P. Bishop Museum Bulletin 142, p. 181, 1938) but differs from that Marquesan species in its relatively shorter second antennal segment and its antennal annuli, as well as in the pattern of dots on the femora. I have seen no species from Guam or elsewhere in the western Pacific which can be confused with *marshallensis*. This is further evidence of the rapid speciation which apparently is characteristic of *Campylomma* in the Pacific. Each isolated island or island group appears to have one or more endemic species. I collected a single specimen of the new species on Kwajalein atoll, June 10, 1950 (erroneously recorded as *Campylomma tahitica* Knight, Usinger, Proc. Haw. Ent. Soc., 14:318, 1951).

Family **Veliidae**

20. **Halovelia marianarum** Usinger

Bikarej, Arno atoll, July 14, 1950 (La Rivers).

Since this manuscript was submitted a collection has been received from Miss Amy Suehiro of the B. P. Bishop Museum. The material was collected by Y. Oshiro on Eniwetok atoll and includes two species new to the Marshalls and three new records for Eniwetok as follows: Pentatomidae—2. *Oechalia consocialis* (Boisd.), Engebi Island, Dec. 24, 1950, *Tournefortia;* 2c. *Platynopus melacanthus* (Boisd.), Bogombogo, Dec. 30, 1950, on flowers; Coreidae 2d. *Liorhyssus hyalinus* (Boisd.), Elugelab, Jan. 14, 1951, sweeping Ilima; Lygaeidae—3. *Nysius pulchellus* Stål, Engebi Island, Jan. 11, 1951; Nabidae—9. *Nabis capsiformis* German, Elugelab, Jan. 28, 1951.

The Biology and Laboratory Culture of Thyreocephalus albertisi (Fauvel) in Hawaii

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In 1947 the Territorial Board of Agriculture and Forestry of Hawaii sent Q. C. Chock to Luzon, in the northern Philippines, to search for natural enemies of the oriental fruit fly, *Dacus dorsalis* Hendel, a serious pest which had recently appeared in Hawaii. Numerous adults and larvae of *Thyreocephalus albertisi* (Fauvel) [2], a common staphylinid predator of fruit fly larvae in rotting fruits in Luzon, were shipped to Honolulu. Efforts to propagate the predator by the Territorial Board of Agriculture and Forestry were successful and widespread releases were made in Hawaii during the next three years.

T. albertisi is known to occur in Australia, New Guinea, the Aru Islands, Ternate, in the Moluccas, and the Celebes. Nothing concerning its life history and habits has ever been published.

The work reported on in this paper was the outgrowth of a need for even greater numbers of the predator for field release, and for orientation in methods of handling staphylinids in anticipation of additional shipments from parasite and predator explorers. The studies were made in the quarantine laboratory of the Pineapple Research Institute in Honolulu.

ADULT STAGE

The adult beetles are striking in appearance, having coal-black, iridescent bodies and gold elytra. The males can be distinguished by their broader heads, which average 2.74 mm. in width, as compared with 2.19 mm. for the females, and by their slightly shorter bodies—about 11.6 mm. long, as compared with 12.4 mm. for the females.

The adults are active, strongly negatively phototropic, and they do not fly readily. They emit a repugnant musty odor when handled or disturbed. As shown in table 1, they were rather long-lived in the laboratory when kept in moist soil with an abundance of fruit-fly-infested fruits. The females lived longer than the males, their adult period averaging 157 days, as compared with 109 days for the males. Mating has not been observed, but a single male can apparently mate with several females, since the number of fertile eggs laid in breeding jars was not influenced by the male ratio. This species apparently is not parthenogenetic, since unmated females isolated in separate jars laid only a few undersized infertile eggs.

[1] Ably assisted by Satoru Shimono.

[2] Determined by R. E. Blackwelder, of the U. S. National Museum, Washington, D. C.

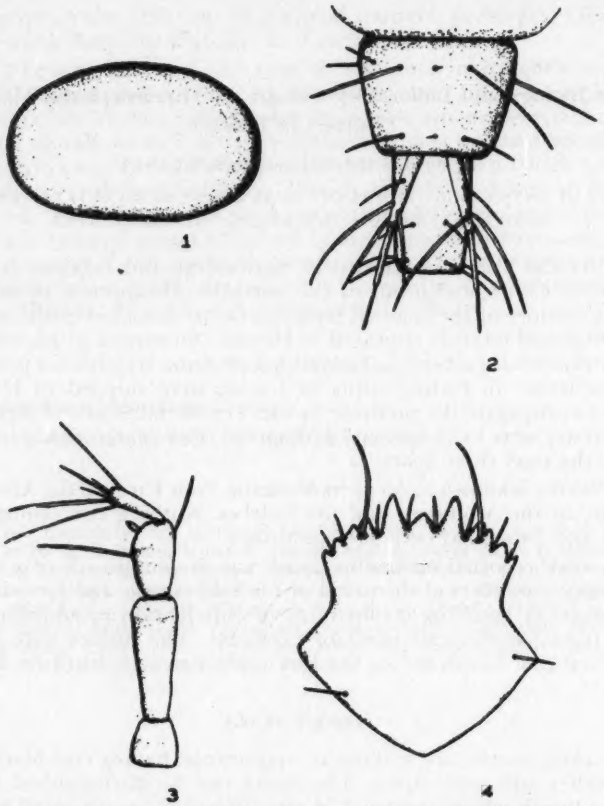

Figure 1.—Egg and second-instar larval characters of *Thyreocephalus albertisi* (Fauvel). 1. Egg. 2. Urogomphi region. 3. Antenna. 4. Nasale of second-instar larva. (Drawn by J. R. Holloway)

Throughout the laboratory rearings there was a very favorable female ratio, which averaged about 2.3 to each male. No apparent seasonal variations in the sex ratio have been observed under laboratory conditions.

The adult females of *T. albertisi* have a rather long and variable preoviposition period, which ranges from 11 to 30 days with an average of about 19 days (table 1). The eggs were laid singly, usually under the fruit. Although the adults constructed terrestrial channels 6 inches deep, most of the eggs were laid at or near the soil surface. In a series of weekly counts 154 eggs were found in the first inch of soil, 46 in the second inch, and none below 2 inches.

The abundance of prey seemed to have a direct effect on the number of eggs laid, the greatest number being deposited when food was plentiful.

Table 1. The longevity, preoviposition period, and egg production of *Thyreocephalus albertisi*.*

Breeding jar No.	Adult population ♀♀	Adult population ♂♂	Longevity of adults (days) Females Individual records	Females Ave.	Males Individual records	Males Ave.	Preoviposition period (days)	Egg production Total	Egg production Average per female	Egg production Week of maximum production
1	8	5	79, 169, 176, 197, 225, 223, 250, 307	203	36, 94, 128, 169, 218	129	30	425	53	19th
2	10	5	61, 125, 149, 156, 177(2), 184, 198(2), 253	168	61, 77, 111, 184, 253	137	23	237	24	16th
3	10	2	25, 116, 172, 239, 179, 232, 246(2), 260(2)	198	239, 253	246	14	851	85	24th
4	11	8	31, 55, 104(3), 132(2), 139(2), 187, 195	119	21, 35(2), 55, 70, 111, 153 (2)	79	18	650	59	8th
5	13	14	16, 79, 107(2), 114(2), 135, 142(2), 149(2), 156, 163	121	16, 30(2), 44(2), 51, 107(2), 114, 121, 128, 149(3)	89	11	940	72	3rd
Average			157	...	109	...	19	620	59	...

* The variations shown in this table were partially the result of seasonal temperature fluctuations in the insectary.

The presence of fruit also seemed to stimulate oviposition. A total of 388 eggs were deposited in one week by 131 gravid females supplied with heavily infested fruits, but they laid only 18 eggs the following week when provided with fruit fly larvae only. When infested fruits were again added during the third week, oviposition increased to 237 eggs.

A test was made to determine how long the gravid females can retain eggs in the absence of fruit, and to estimate more precisely the importance of the presence of fruit in egg production. Twelve gravid females of equal ages, which had just begun to lay eggs, were divided into two equal lots. One group was supplied with large numbers of fruit fly larvae without fruit, while the other received infested guavas containing an equal number of larvae. In the first week the predators caged with both guavas and oriental fruit fly larvae deposited 40 eggs. Those in the cage without guavas laid only 18 eggs. In the second week, however, the staphylinids in the cage with fruit laid only 24 eggs, as compared with 40 eggs produced by the staphylinids in the cage without fruit. The number of eggs laid during the third and fourth weeks was 29 and 9 for the beetles in the cage containing fruit, and 32 and 7 for the females without fruit. These results indicated that gravid females are able to retain their eggs for no more than a week in the absence of favorable conditions. During the 4-week period, the staphylinids supplied with fruit deposited a total of 102 eggs, while the beetles in the other group laid 97 eggs.

The fecundity of *T. albertisi* is rather low. As shown in table 1, the minimum number of eggs per female was 24, the maximum 85, and the average 59. The adults generally required a long time to reach maximum oviposition rates, but they continued to deposit fertile eggs until death. In most of the breeding jars maximum oviposition did not occur until after the fifteenth week. Several females produced fertile eggs after they were 7 to 10 months old.

IMMATURE STAGES

The records on the periods required for the various developmental stages are summarized in table 2.

Egg Stage: The egg (fig. 1,l) is milky white in color, with a thin, faintly sculptured and relatively opaque chorion. In shape and appearance it resembles a very large ant egg and measures 2.26 mm. in length and 1.29 mm. in width. Infertile eggs, of which there are usually very few, are considerably smaller and have a yellowish tinge. About 80 per cent of the eggs hatched when kept in moist soil.

Larval Stage: The hatching first-instar larva cuts a neat slit through the chorion, which it never consumes, and almost immediately begins an amazingly active and vicious life. One newly hatched larva was observed to kill four small melon fly larvae within 4 minutes. These young predators are able to subdue fruit fly larvae of any size, and will attack puparia when active larvae are not available. They are also cannibalistic, eating eggs, pupae, and even active larvae of their own kind. They are generally found within the first inch of soil, and often within infested fruits on the

soil surface. The campodeiform newly hatched larvae average 6.67 mm. in length, the head being about 1.18 mm. wide by 1.40 mm. long.

Newly moulted second-instar larvae are about 13.33 mm. long. The head is about 1.56 mm. wide and 1.75 mm. long. Except for their larger size, they bear a general resemblance to those of the first instar. *T. albertisi* appears to have only two larval instars.

Table 2. Duration of egg, larval, and pupal stages of *Thyreocephalus albertisi.*

Stage	Number	Length of Stage (days) Range	Average	Number
Egg	15	4- 6	5	5
First-instar larva	148	4- 8	6	5
Second-instar larva	154	8-24	13	13
Pupa	127	8-18	11	12

The morphological characters generally used in the identification of larval Staphylinidae (Mank 1923), namely, the nasale or "upper lip," the pygopod and urogomphi, and the antennae, are illustrated in figure 1.

During the first half of their existence, second-instar larvae are as active as those of the first instar, but they later become sluggish as their bodies increase in size. They are generally found deeper in the soil and are less often seen in fruits. The full-grown larva has a greatly distended abdomen about 17 mm. long, and in this stage it constructs a cell where it may remain as long as 10 days, apparently without feeding, until it finally pupates. The quiescent prepupal stage is very easily injured, and often a slight disturbance of the earthen cell or of the larva itself may result in an aborted pupa or death.

Pupal Stage: The pupa ranges in color from light yellow to almost brick red, and measures about 3.65 mm. in width and 8.25 mm. in length. The head and thorax are fused, but the abdomen is capable of vigorous side-to-side and circular motion. Should the cell wall collapse, the pupa can restore its shape with abdominal movements. The pupal cell also provides ample aeration, which probably prevents the growth of harmful molds often associated with pupae in imperfect cells. The emerging adult does not consume the pupal case. Its first activity is that of constructing terrestrial channels.

FEEDING POTENTIAL OF THE PREDATOR

A series of laboratory feeding tests were conducted with both larvae and adults of *T. albertisi,* to determine their potential capacities as fruit fly predators. Individual first and second-instar larvae and adults were placed in pint jars half-filled with soil and supplied at weekly intervals with papaya sections containing known numbers of half-grown oriental fruit fly larvae. Similar units were held without the staphylinids, to serve as checks. Predation was then estimated by comparing the surviving fruit fly populations in the different series of jars. The indicated destruction of prey by each stage of *T. albertisi* is shown in tables 3 and 4.

As noted in table 3, about 11 fruit fly larvae were apparently killed per predator in 6 days by first-instar *T. albertisi*, as compared with 15 in 12 days per second-instar predator. An average of approximately 26 fruit fly lavae were thus destroyed by each larva of *T. albertisi*.

With regard to adult predation (table 4), each mature gravid female destroyed about 28 *Dacus dorsalis* larvae per week, as compared with only 10 per week by mature males of the same age. Young females consumed fewer larvae than did older ones, and predation was greatest at the peak of oviposition. An average female may therefore theoretically consume or destroy from 500 to 600 oriental fruit fly larvae during her entire larval and adult life span.

In separate tests both larvae and adults of *T. albertisi* were successfully reared on oriental fruit fly larvae and puparia in the absence of fruit, indicating that this species is very largely or entirely carnivorous.

Table 3. Destruction of third-instar oriental fruit fly larvae by first- and second-instar larvae of *Thyreocephalus albertisi*.

	First-instar larvae		Second-instar larvae		
Jar No.	Period (days)	Fruit fly destroyed	Period (days)	Fruit fly destroyed	Total
1	5	9	16	21	30
2	8	15	13	9	24
3	5	9	20	22	31
4	5	10	16	14	24
5	5	6	13	17	23
6	6	13	8	13	26
7	7	13	7	14	27
8	6	10	8	14	24
9	7	15	7	13	28
10	7	8	7	13	21
Total	61	108	115	150	258
Average	6	11	12	15	26

Table 4. Destruction of third-instar oriental fruit fly larvae by adult *Thyreocephalus albertisi*.

Predator adults		Larvae destroyed				
Sex and age (days)	Number	1st week	2d week	3d week	4th week	Average per adult per week
Females, 70	2	111	31	37	35	26.8
	1	53	12	15	..	26.7
	2	102	16	..	..	29.5
Males, 70	2	45	6	9	21	10.1
	1	15	5	7	..	9.0
	1	10	0	..	..	10.0
	1	16	..	..	..	16.0
Females, 2	1	22	6	11	30	17.3
	5	62	..	..	..	12.4
Males, 2	2	24	18	..	..	10.5
	2	32	..	..	..	16.0

LABORATORY CULTURE

Heretofore staphylinid larvae have been reared in individual salve tins—a laborious method—to prevent cannibalism. This method greatly restricts the number of adult insects that can be produced for field release. It was therefore hoped that cannibalism might be largely eliminated in community cultures by supplying the predators with excess numbers of prey upon which to feed.

Promising results were obtained in preliminary experiments utilizing various numbers of newly hatched *T. albertisi* larvae in battery jar and beaker units supplied with heavily infested fruits. About 50 per cent of the predators survived to the pupal stage when their average density was one per cubic inch of soil. Weekly examinations showed an average of 8 to 10 oriental fruit fly larvae and puparia per cubic inch of soil in these units.

The need for an abundant food supply made it desirable to find a suitable host insect that would be easier to obtain and to rear in large numbers throughout the year than the oriental fruit fly. Tests were conducted using house fly maggots. They proved to be an excellent source of food for the predators, which developed normally until they reached the quiescent prepupal stage, when the ravenous house fly maggots reversed their intended role and attempted to attack the prepupae. The continual disturbance by the burrowing maggots caused a high percentage of aborted pupae, and in several tests the maggots actually consumed the staphylinids. Subsequent tests with house fly puparia and with inactivated maggots that had been killed by immersion in hot water were also unsuccessful.

The possibility of using larvae of the melon fly, *Dacus cucurbitae* Coquillett, was then investigated. Eggs were readily deposited in cucumbers that had been punctured with a dissecting needle, and when the melon fly larvae were nearly mature the cucumbers were split open and placed on the soil in the breeding units. It was soon noticed that, despite the use of sterile soil, many of the staphylinid larvae were infested with small brownish mites, which sometimes almost completely covered the larval epidermis. When numerous they prevented the normal moulting of *T. albertisi* larvae, causing high mortalities and many aborted pupae. These mites were identified by I. M. Newell, of the University of Hawaii, as the hypopi, or migratory nonfeeding stage of *Anoetus* (*Histiostoma*) sp., a common soil-inhabiting scavenger.

Tests with several acaricides showed that the mites could be effectively controlled by lightly spraying the cucumbers with a 5 per cent solution of benzyl benzoate and mixing about 1 gram of DMC[3] with each 1,000 cc. of soil. Neither material was fully effective when used alone, and higher concentrations were toxic to the predators.

An attempt was then made to mass-culture *T. albertisi* in standard metal holding boxes of the type in use at the Oriental Fruit Fly Laboratory. The boxes were 17 inches long, 13 inches wide, and 6 inches deep, and each contained about 3½ inches of sterile soil covered with a 1-inch

[3] Dimethylcarbinol.

layer of peat moss, to absorb excess moisture from the infested cucumbers. Acaricides were applied as indicated above, and from 200 to 400 staphylinid eggs were evenly distributed beneath the layer of peat moss in each box. New heavily infested cucumbers were added each week until the predators had pupated (about 30 days later), when the boxes were dismantled and the pupae were removed and placed in ice-cube-tray compartments on moist sand under glass, to await adult emergence.

Even with an excess of food, the predator larvae tended to congregate in the corners of the large holding boxes where they sometimes attacked one another. Removable metal baffles forming 3 and 6-cubic-inch compartments were placed in the boxes, but these failed to increase the survival rates and were later discarded. About 38 per cent of the staphylinids survived to the pupal stage in these units, as compared with approximately 75 per cent in the individual salve tins. However, this loss was more than offset by the saving in labor and greater overall efficiency of the mass-culture method.

Stock supplies of adult beetles of *T. albertisi* were kept in large battery jars half-filled with moist sterile soil covered with a 1-inch layer of peat moss and provisioned with heavily infested fruits. Eggs were removed each week, using a sieving and flotation technique, to prevent their destruction by newly hatched larvae. The soil was gently washed through successive 4-, 16-, and 32-mesh screens, which removed the adult beetles and debris on the first and second screens. The eggs and smaller particles remaining on the third screen were then placed in a saturated brine solution in a large shallow pan, where the eggs promptly floated to the surface. They were then skimmed off with a small 32-mesh screen scoop and were immediately rinsed in fresh water. Hatching of these eggs averaged 71 per cent, as compared with 74 per cent when the eggs were sieved but not placed in brine, and 79 per cent when they were collected by hand without either sieving or flotation on brine. About 20 per cent more eggs could be recovered by the sieving and flotation technique than by the former method of visual inspection.

LIBERATIONS

A total of 1,015 adults and 2,198 eggs and larvae of *T. albertisi* reared during these investigations were liberated in the Waiahole, Waimanalo and Moanalua guava areas on the island of Oahu from July 6 to November 10, 1950. Establishment was encouraged by placing the insects in large piles of infested guavas in favorable locations containing an abundant sequence of fruiting species. Although evidence of breeding was noted at these sites for several weeks after liberation, no recoveries have since been made and *T. albertisi* is not known to be established in Hawaii.

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Echthromorpha from the Marquesas and Society Islands (Hymenoptera: Ichneumonidae)

By J. F. PERKINS

BRITISH MUSEUM (NATURAL HISTORY)

Due to the kindness of Elwood C. Zimmerman, I have been able to examine a series of *Echthromorpha* from the Marquesas and Society Islands collected by the Pacific Entomological Survey. A report on the material is presented here. The holotypes of the new forms will be stored at Bishop Museum, Honolulu, and some of the paratypes are in the British Museum.

A. Species from the Marquesas Islands

A single species of *Echthromorpha* has so far been described from the Marquesas Islands; it is:

Echthromorpha marquisensis marquisensis (Cheesman), new combination.

Echthromorpha atrata subspecies *marquisensis* Cheesman, 1928.
Echthromorpha opaca Cushman, 1939, new synonym.

This subspecies is represented in the Pacific Entomological Survey collection by the following material:

Hiva Oa: Kopaafaa, 2,770 feet, August 2-3, 1929, 2 ♂, 1 ♀ (Mumford and Adamson). Teava uhia i te kohu, 2,100 feet, February 15, 1930, sweeping over *Paspalum conjugatum*, 2 ♀ (Mumford and Adamson). Atuona Valley, March 28, 1929, on *Morinda citrifolia*, 1 ♂ (Mumford and Adamson). Anatikane, 1,750 feet, August 1, 1929, on *Piper latifolium*, 1 ♂ (Mumford and Adamson). Kaava ridge, 2,800 feet, January 8, 1932, 1 ♀ (Le Bronnec). Feani ridge, 3,800 feet, January 22, 1932, 1 ♀ (Le Bronnec). Kakahopuanui, 2,500 feet, January 5, 1932, sweeping herbage, 1 ♂ (Le Bronnec).

Tahuata: Pahukoa ridge, 1,100 feet, July 25, 1930, 1 ♂, 2 ♀ (Le Bronnec and H. Tauraa). Hanahévane Valley, sea-shore, July 15-16, 1930, 5 ♀ (Le Bronnec and H. Tauraa). (Same data as type of *E. opaca* Cushman.) Hanateio Valley, 1,000 feet, July 23, 1930, 1 ♀ (Le Bronnec and H. Tauraa). Tehue Valley, 600 feet, May 27, 1930, 3 ♂ (Le Bronnec and H. Tauraa). Kiinui Valley, 1,100 feet, June 16, 1930, 1 ♂ (Le Bronnec and H. Tauraa).

Ua Huka: Viatiake, 1,000 feet, March 24, 1931, 1 ♀ (Le Bronnec and H. Tauraa). Tauheeputa, 1,770 feet, March 23, 1931, on *Abutilon menziesii*, 1 ♂ (Le Bronnec and H. Tauraa).

I have also examined 3 ♂ and 3 ♀ from Fatu Hiva (including the type of *marquisensis*), 4 ♂ from Tahuata and 3 ♂ from Hiva Oa (L. E. Chees-

man) in the collection of the British Museum (Natural History). The specimens from the Marquesas determined as *E. walkeri* by Miss Cheesman are males of *E. marquisensis.*

In the above material, I find little difference between specimens from the different islands, but in the females those from Tahuata often have more distinct yellow markings on the abdomen. The three females from Ua Pou, however, are all very much more copiously red marked and these are described as a distinct subspecies. I am unable to distinguish the male.

Echthromorpha marquisensis uapou, new subspecies.

Differing from the typical subspecies in having the thorax red, with the pronotum in the lower angles and centrally, the prepectus, the mesopleuron posteriorly dorsad, the mesonotum centrally, anteriorly and the propodeum along the posterior margin, together with all the sutures, black or fuscous; abdomen red with segments 2-5 sometimes infuscate basally (and more or less yellow marked laterally, subapically); hind coxa entirely red; scape conspicuously marked with yellow beneath.

Holotype female: Ua Pou: Hakahetau Valley, 1,000-2,000 feet, January 31, 1930 (R. R. Whitten). *Paratypes:* 1 ♀, same data as type; 1 ♀, Koputukea, Hakahetau Valley, 1,150 feet, November 16, 1931, sweeping over *Gleichenia linearis* (Le Bronnec).

Also from Ua Pou are the following :3 ♂ from Hakahetau Valley; 1,000 feet, January 29, 1930; 1,200 feet, December 6, 1929 and 2,000 feet, December 26, 1929 (R. R. Whitten).

The form from Nuku Hiva differs not only in colour, but also quite markedly in sculpture, and this I am regarding as a distinct species which is described below.

Echthromorpha nukuhivae, new species.

♀. Head polished with the frons weakly coriaceous and the antennal scrobes weakly, irregularly trans-striate, the face coriaceous, this sculpture being weaker centrally, dorsad, with sparse, rather coarse, shallow punctures which are sparser centrally, and with rugae beneath the antennal sockets, clypeus with rather sparse, fine punctures laterally and basally; face as long as broad; malar space subequal in length to the breadth of base of mandible; junction of genal and hypostomal carinae about 2.5 times the length of the malar space from the lower articulation of the mandible.

Thorax mat through coriaceous sculpture, with only the lower angles of pronotum, the subalar callus in part, the scutellum centrally and the apex of the propodeum, the mesepisternum and the basal groove of the propodeum shining; pronotum striate in the lower angles, in the transverse groove and just in front of the hind margin of the lateral angles, the central area of the lateral angles coriaceous but with this sculpture tending to form irregular striae; mesonotum closely, shallowly punctate centrally and in the middle line of the lateral lobes, the lateral lobes otherwise with sparser very shallow punctures; notaulices very weakly indicated anteriorly; scutellum more closely punctate centrally than in *marquisensis;* mesopleuron and mesosternum with shallower punctures than in *marquisensis,* the mesosternum more sparsely punctate, the whole pleuron, including the speculum, and the sternum, dull; propodeum similar to *marquisensis* except for the coriaceous ground sculpture, without apophyses.

Abdomen with the first tergite coriaceous except for the base, with a few shallow punctures laterally; tergites 2-7 very closely punctate, with the apical margin coriaceous with shallow, scattered punctures (in *marquisensis* the apical margin laterally has minute punctures, not conspicuous, coriaceous sculptured); ovipositor sheath a little more than half as long as abdomen.

Coxae coriaceous, with sparse punctures, the hind coxae with the microsculpture coalescing to form transverse striae dorsally; hind femur with weak coriaceous sculpture, the punctures in the upper half much shallower and sparser than in *marquisensis*.

Black; clypeus apically pale yellow laterally, fading into red centrally; red spot on the lower margin of the antennal socket; frontal orbits usually marked with red; scape reddish beneath; mandibles marked with pale yellow basally; front margin of pronotum narrowly red laterally; subalar callus usually red; tergites 2 or 3-5 red or reddish apically, tegite 6 red marked with black basally, tergites 6-7 red, 6 sometimes infuscate basally; front coxae more or less reddish; posterior coxae weakly marked with red internally; trochanters more or less marked with red dorsally; femora red; tibiae and tarsi fuscous or piceous, the front tibiae sometimes with a pale yellow spot apically; wings hyaline, venation black.

Length, 9-14 mm.
♂. Unknown.

Holotype female: Nuku Hiva: Vaihakameama, 2,600 feet, June 19, 1931 (Le Bronnec and H. Tauraa). *Paratypes:* 3 ♀, same data as type; Tapuao Oa, 2,600 feet, May 30, 1931, 2 ♀ (Le Bronnec and H. Tauraa) and at 3,100 feet, November 11, 1929, 1 ♀ (Mumford and Adamson).

Differs from *E. marquisensis* in the pronounced coriaceous ground sculpture, particularly of the thorax and legs, and in the weaker, sparser punctures; in colour also, in the black outer and facial orbits, the mostly black thorax, the much darker coxae and the darker abdomen.

B. Species from the Society Islands

The following species were examined from the Society Islands. All were collected by A. M. Adamson.

Echthromorpha agrestoria Swederus.

Tahiti: Papenoo Valley, 150 meters, October 25, 1928, 10 kilometers from the sea, 6 ♂; October 27, 1928, 6 kilometers from the sea, 1 ♂; 300 meters, October 26, 1928, 10 kilometers from the sea, 2 ♂. Papeavi, 50 feet, November 9, 1928, over *Tradescantia*, 1 ♂; Paea, 600 feet, August 28, 1928, 2 ♂, 1 ♀. Fautaua Valley, 1,000 feet, August 23, 1928, 1 ♂; 1,500 feet, September 11, 1928, 2 ♂.

Moorea: Faaroa Valley, 1,000 feet, December 4, 1928, 3 miles from the sea, 1 ♂.

I have examined specimens of this species also from Rapa (British Museum collection).

Echthromorpha walkeri Cameron.

Tahiti: Faa, 300 feet, September 7, 1928, 6 kilometers from the sea, 1 ♂.

I have seen this species only from the Society Islands. The specimens from the Marquesas recorded under this name by Miss Cheesman are males of *E. marquisensis* Cheesman.

C. Synonymy in Echthromorpha

Echthromorpha inimica (Smith 1863), new combination.

Pimpla inimica Smith.

Echthromorpha immaculata Krieger 1908.
Echthromorpha diversor Morley 1913, new synonym.

Echthromorpha plagiata Smith 1858.
Pimpla plagiata Smith.
Echthromorpha wallacei Cameron 1912.

Echthromorpha nigricornis (Smith 1864), new combination.
Pimpla nigricornis Smith.
Echthromorpha maxima Krieger 1908, new synonym.

Echthromorpha arrogans (Smith 1863), new combination.
Pimpla arrogans Smith.

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Species marked with an asterisk were reported in the Hawaiian Islands for the first time in 1951 on the dates recorded in the text. Those not so marked were observed here prior to that year, but have only now been identified or recorded. For particulars refer to the pages indicated.

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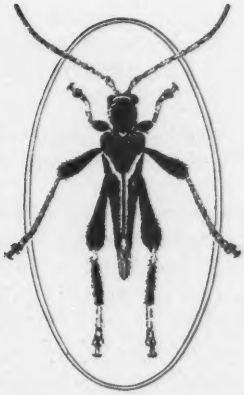

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ERRATA, VOLUME XIV

Page 2, line 13 from bottom, for *"pseudoalternata"* read *"pseudalternata"*.

" 4, line 24, for *"australasica"* read *"australasiae"*.

" 6, last line, delete "active and".

" 13, line 6, for "on" read "in".

" 18, line 16 from bottom, for "Ashmead" read "(Ashmead)".

" 154, lines 6 and 7 of 2nd paragraph, for *"Crytostachys"* read *"Cyrtostachys"*.

" 154, line 14 of 2nd paragraph, for *"Crystostachys"* read *"Cyrtostachys"*.

" 201, line 15, for **"multilineata"** read **"flavolineata"**.

" 208, line 17 from bottom, for "beet" read "sweet potato".

" 212, line 16 from bottom, for *"bicapularis"* read *"bicapsularis"*.

" 218, line 5, for "sphenophori" read "obscurus".

" 222, line 12 from bottom, for "fowl" read "foul".

" 227, line 7, for "H.H." read "H.L."

" 237, line 5, for "Skuse" read "(Skuse)".

" 312, lines 8 and 9 should be interchanged.

" 331, line 7 from bottom, for *"umbrosa"* read *"umbrosus"*.

ERRATA NOT PREVIOUSLY NOTED

Vol. VI, page 406, line 12 from bottom, for *"Spodoptera"* read *"Scotorythra"*.

" VII, page 418, line 2, for *"trifida"* read *"tridens"*.

" VIII, page 140, line 4, for *"trifida"* read *"tridens"*.

" XIII, page 29, line 25, for *"Cytogaster"* read *"Cyrtogaster"*.

" XIII, page 219, lines 3 and 4, for *"clostocerus"* read *"closterocerus"*.

" XIII, page 265, line 6 from bottom, for "12" read "13".

" XIII, page 332, line 4 from bottom, for *"Diarthromyia"* read *"Diarthronomyia"*.

" XIII, page 461, righthand column of Index, line 23 from bottom, for *"Cytogaster"* read *"Cyrtogaster"*.

" XIII, page 462, righthand column of Index, line 18, for *"capaniformis"* read *"campaniformis"*.